Sept. 5, 1967

A/

9/5/67 w/ comments Borman

NOTES
MR. GORMAN'S COPY
SEP 5 1967

w/ Comments

No comment marked for
DEP-A

NOTES 9/5/67 BALCH

9/5 9A

B 9/10

S-IC-5 Testing - Data from the static firing on 8/25/67 indicate that objectives of the end item test plan were met. Removal of stage from test stand is still set for tomorrow, 9/6/67, but may be delayed because of the S-II-3 tanking test scheduled for the same day. ✓

S-II-3 Testing - Because of delays in prerequisite testing, late completion of LH_2 overboard bleed system installation, and open quality paper work, the LOX/LH_2 tanking has been rescheduled from 9/2/67 to 9/6/67. First static firing is still scheduled for 9/21/67, but prospects of meeting this schedule are marginal. ✓

S-IC-6 Stage - Delivery of stage to MTF, previously scheduled for tomorrow, 9/6/67, is now pending anticipated realignment of the S-IC test program at MTF. ✓

MTF Transportation - MSFC representatives visited MTF on 8/29/67 for discussions relative to a GSA study to be performed next month to determine whether it is feasible for GSA to assume MTF transportation support on 7/1/68. MSFC and MTF representatives are in agreement on the approach to the study and on the need for a preliminary planning meeting of MSFC, MTF, and GSA representatives at MTF during September. ✓

Alleged Damages from Stage Firing - A total of eight complaints alleging damages as a result of the static firing of the S-IC-5 stage on 8/25/67 have been received. Alleged damages have been mainly to brick and block walls. Investigations are underway. ✓

NOTES 9/5/67 BELEW

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ATM MOCKUP: The ATM mockup has been refurbished and will be available for viewing during the ATM Project Review on 9/6/67. While it is not totally up to date, it shows significant improvement over its predecessor. Plans are to update the mockup on a periodic basis (about every two months).

ATM CONFIGURATION MANAGEMENT PLAN: On 8/28/67, we met with the ATM Lead Lab Managers and discussed in detail configuration control. Overall agreement was reached and the results will be documented in a joint Project Office/Lead Lab configuration management plan.

ATM NEUTRAL BUOYANCY TESTING: We have an initial reaction from MSC concerning the use of their neutral buoyancy tank for our ATM engineering evaluation. Indications are that the tank may be available for our use during the last quarter of this year. MSFC's facility is heavily scheduled with Workshop efforts.

ORBITAL WORKSHOP (OWS) CREW QUARTERS FLOOR PLAN: MSC's Principal Investigator has proposed a revised main floor plan. The floor plan change provides for egress from any compartment by passing through a single doorway. Both sleep areas, the food management area, and the waste management all have a doorway that opens to the work area. The sleep areas are separated by the food and waste management areas. It is being evaluated by the Lead Lab/Project Office.

OWS STABILIZATION FOR THE AAP-1/2 MISSION: In a review with R&DO on the results of several trade studies concerning the OWS stabilization/thermal balance/power for the AAP-1/2 Mission (Mission A), an agreement was reached on a basic approach to provide a stabilization system tailored to provide the capability for an orbital orientation during Mission A to satisfy the thermal balance and power requirements. The approach includes a bi-propellant propulsion system located on the S-IVB aft skirt with sensing and control electronics in the Instrument Unit. Also, Solar Array locations were chosen which will permit an optimization of the Solar Array size. Upon completion of several open action items (such as impact of rotating the Multiple Docking Adapter 45° to accommodate the selected location of OWS Solar Arrays), we expect to complete coordination with MSC, finalize the design/performance requirements, prepare the details of a development plan and prepare a request to Mr. Mathews for a Cluster baseline change.

INTEGRATION CONTRACT: In accordance with the direction from C. Mathews, we are proceeding with Martin to extend the Phase C contract for 90 days. The Lockheed contract will be extended, but only to cover ATM thermal analysis work, for a limited period (60 days) to permit Martin buildup and smooth transition in this critical area.

NOTES 9-5-67 BROWN

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H-1 ENGINE Five of a six bomb test series has been completed at the Test Laboratory Power Plant Test Stand (PPTS) as part of the H-1 stability study utilizing engine H-4067. The engine damped normally in each test. This engine was inadvertently bombed at a very high thrust (over 219K) on the fourth test. It has been removed from the test stand for a detailed inspection before the last test is conducted. Engine H-156 will be installed in the PPTS early next week. This engine demonstrated a RCC cutoff at Neosho last Thursday. Testing of H-156 on PPTS is expected to confirm that the instability at Neosho is caused by a facility anomaly. ✓

F-1 ENGINE Subsequent to static firing of the S-IC-5 stage at MTF, the ground test instrumentation installed for measuring static firing temperatures was inspected on August 31, 1967. This inspection revealed that the facility oriented turbine inlet thermocouple installed on engine F-5041 had one and three quarters inches of its tip broken off. Turbopump torque checks revealed no interference problems, but inspection of the turbine assembly and heat exchanger will be required. An EFIR has been released to perform the inspection in the test stand at MTF. ✓

J-2 ENGINE The engine checkout activities at KSC are proceeding normally. All kits for AS-501 are on site and the LOX pump seal cavity vent line installation (ECP 620) is in progress on S-II-501. DAC will schedule the effort prior to CDDT (9/19/67).

There were four tests at AEDC September 1, 1967. The tests consisted of two 80-minute restart couples. The first burns were 30 seconds each and the restarts were programmed for five seconds. The first restart was successful. The last test was cutoff by a gas generator overtemperature (GGOT) condition. It appears the GGOT was caused by excessive start bottle energy, however, no definite conclusions can be reached until the data are evaluated. We do not expect any new anomalies. During this test series the drain line burn-off ends for the LOX turbopump primary seal leakage was evaluated. There were 12 lines positioned about the chambers; two with GOX flow. The first look at the data indicates no problem with this design. ✓

NOTES 9/5/67 CONSTAN

GD 9/5

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F-1 Engine

The GG exhaust temperature transducer on engine F-5041 (Position 2 on S-IC-5) failed during static testing. Upon removal it was observed that the probe portion was missing. It must be assumed that the probe passed through the turbine. A UER has been written against this failure and a recommendation from Rocketdyne has been requested.

Possible recommendations, at this time, could range from removing the heat exchanger and examining the first and second stage turbine wheels while the stage is in the stand to complete replacement of the engine.

This particular instrument is supplied by GE at MTF for installation by The Boeing Company for use during static firings only.

Cracked Solder Joints

CCSD was authorized to remove the telemetry equipment on S-IB-5 in order to inspect for possible cracked solder joints.

S-IB-5 Post-storage Plan of Work

CCSD has presented a work plan for S-IB-5 in compliance with the time frame requested by Change Order MICH-120 which lists open work to be accomplished prior to shipment of the stage to KSC assembly scheduled for December 28, 1967.

Stage S-IB-5 has been released from storage as of August 31, 1967, and post-storage modifications have commenced with first priority being given to changeout of components containing elastomers with six months or less unexpired life due to turn around time from vendors (example: swivel joints of the umbilical connection). (No physical movement of the stage has occurred.)

B 2/10

NOTES 9/5/67 FELLOWS

GS 9/6

1. MSFC Liaison Office at MSC: Bill Davidson, the MSFC Liaison Resident at MSC for the past 3 1/2 years, has by mutual agreement transferred from R&DO to IO and is moving from Houston to Denver, where he will be associated with the Martin AAP Integration Contract. Mr. Jeffrey Hamilton, who has been the IO representative in the Liaison Office at MSC, will remain there and carry on the MSFC liaison activities.

2. MSFC/KSC Mutual Assistance Program: Thus far, the names of 70 technically qualified R&DO individuals, in support of 31 tasks, have been referred to KSC. Twenty-eight people, associated with twenty-one tasks, have been selected and twenty-five have reported to KSC to date.

NOTES 9/5/67 GEISSLER

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1. AAP Mission Requirements Panel: In the fourth meeting of this panel at MSFC on August 25, 1967, a review of the AAP-3 (SA-211) weight and performance for the cluster mission showed that the AAP-3 payload is currently 5,391 lbs above the presently committed payload capability of 40,000 lbs inserted into an 81 x 120 n. mi. orbit. Two potential improvements, (1) off-loading consumables from AAP-3 into the AAP-4 LM ascent stage and (2) flying the AAP-3 CSM as a third stage to insertion, appear less favorable than originally envisioned. The LM ascent stage is now near the structural limit of 10,000 lbs. so that little AAP-3 off-loading can be tolerated and the potential payload gain of flying the CSM as a third stage may be lost due to less efficient guidance over the longer range angle.

E.F. That's the proposed solution? MM-weapons aren't available yet for AAP-3, unless schedule is slipped, right? B

2. Saturn V Launch Release Wind Criteria: Re: question raised at AS-501 Flight Readiness Review pertaining to launch release wind criteria: the Apollo Program Specification, SE 005-001-1 Revision A dated March 1, 1966 states that the Saturn V space vehicle shall be capable of being launched in the 95 percentile peak surface wind conditions. (This is 28 knots peak at the 60 foot reference level). The launch vehicle capability remains at 99 percentile for the launch release winds. The S/C did not meet this criteria, and rather than beef-up the S/C structure, the decision was made by MSC and concurred in by Headquarters to reduce the space vehicle criteria to 95 percentile. This launch release criteria applies for both block I and block II spacecraft to be flown on Saturn V.

3. SST (Supersonic Transport) Acoustic Work: A meeting at Langley Research Center (LaRC) on July 19, 1967, resulted in definite interest by LaRC and OART personnel in MSFC acoustic personnel capabilities, in-house experimental facilities and their possible contribution to the SST acoustic problems. The importance of these problems has reached the presidential level and will decide the future of the SST and jet port activities. The above interest represents a new market for MSFC resources. Some of the current MSFC space vehicle acoustic effort applies directly to the SST acoustic problem area. However, our capability to explore further and support the problem of the SST, is severely handicapped by lack of civil service personnel, aggravated by recent losses in that area. Potential qualified replacements are available, but action is presently stopped due to hiring freeze.

E.F.

We can expect a discussion of this issue only after we have a NASA FY 68 Appropriations Act, and after Hq. has decided on overall posture and program emphasis in FY 68 AA.

I expect clarity on all this on or around 1 October 67

B

NOTES 9-5-67 GRAU

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GSE - SANDERS DISPLAY: ME Lab is in the process of reworking solder joints on printed circuit boards for use on AS-501 launch. Since we continue to have difficulties with the quality of hardware delivered by Sanders, IO is preparing a letter to Sanders for your signature and we have informed DCAS to employ 100% in-process inspection in any future Sanders hardware. ✓

NOTES 9/5/67 HAEUSSERMANN

1. Personal Achievements. Mr. Michael T. Borelli, Chief of the Advanced Flight Control System Section of R-ASTR-F received his Ph.D. degree in electrical engineering from Auburn University on August 23, 1967. This is the third Ph.D. degree received by a member of R-ASTR-F within the past two years.

2. National Research Council Post Doctoral Fellowships. The fellowship for Dr. Frik, Stuttgart, Germany, has been confirmed and his reporting date to Astrionics is November 1, 1967. Dr. Miura, University of Tokyo, Japan, also has been confirmed with a reporting date of about December 15, 1967.

3. Saturn 501 Flight Control Computer. The reworked computer has been completely checked out in our Flight Simulation Lab and was delivered on Sunday morning to IBM for shipment to the Cape.

4. ATM Crew Training and EVA Review. Three meetings were held last week on this subject.

a. MSFC personnel met with the AAP astronauts and MSC crew systems personnel to discuss ATM crew training requirements. Astronaut training equipment and length of time for training were suggested by MSFC and is to be reviewed by MSC.

b. Discussions were held by MSFC personnel with NASA biomedical personnel at Flight Research Center (FRC), Edwards Air Force Base, concerning the possibility of biomedical evaluations during neutral bouyancy testing for indication of astronaut fatigue while performing EVA on the ATM mission. Dr. Charles Lewis of FRC indicated they would be interested in doing this testing so they could get the data for their total biomedical program.

c. MSFC and MSC personnel and AAP astronauts met at Lockheed/Sunnyvale to review a concept of film removal on the sun end of the ATM. The review confirmed that the task will be difficult, but further design of an astronaut work station should make the task possible from a system and crew safety standpoint.

5. ATM Experiment Package Gimbal. A design review was held with Perkin Elmer for subject gimbal system. No major design problems have been identified. Due to delivery of vendor items to Perkin Elmer, it is anticipated that the first gimbal system will not meet the present contract date (12/15/67).

6. ATM Flat Cables. Extensive use of flat cables for ATM was an initial objective. Fabrication of the connectors for flat cables from industry was not possible in the required time frame and not too acceptable by industry due to the low volume. An alternative considered was to produce these connectors in-house, but the decision was not to expend our manpower on this type of activity. We are now reassessing where flat cable should be applied on ATM. As a minimum, we will use it across the pitch and yaw gimbals of the experiment package. The torques due to flat cables are several orders lower than with conventional round cables.

B 3/11

NOTES 9/5/67 HEIMBURG

9/5 RS

S-IB-11

The schedule for arrival of this stage in Test Laboratory is not firm, however, it is tentatively expected on October 9, 1967.

S-II-3, A-1 TEST STAND (MTF)

The LH_2-lox loading countdown was initiated on September 2, 1967, but was scrubbed at approximately 5:30 pm, when SD failed to get into Section 5, the terminal phase of tanking. The test is rescheduled for Wednesday, September 6, 1967.

F-1 ENGINE

Test FW-069 was conducted on the West Area F-1 Test Stand on September 1, 1967, with F-1 engine S/N F-5038-1 to evaluate the thrust vector control system problem on 501 caused by Hydraulic Research Actuator spring failure.

(ATM) SOLAR PANEL DEPLOYMENT

A series of tests was conducted on an air pad test beam assembly supplied by R-ASTR. The purpose of the tests was to determine the feasibility of utilizing air pads to support the solar panels during deployment testing.

MODERATE DEPTH LUNAR DRILL PROJECT

The nitrogen compressor designed by Nortronics/Huntsville was fabricated by R-TEST. The compressor testing will be initiated after assembly. The Rotary Concept engineering model lab unit is now operational and testing has been initiated.

H-1 ENGINE

Three tests were conducted on the H-1 engine (4067) instability series at the Power Plant Test Stand (PI-504, 505, 506) during this week to conclude this series. The engine will be disassembled to check for any possible hardware damage. H-1 engine (R&D) serial number 159 which had demonstrated unstable operation at Neosho will be shipped to Test Laboratory for a series of bombing tests to determine facility influence. This will end the H-1 engine instability test series unless special problems develop.

NOTES 9-5-67 HOELZER

B 9/11

$2915

MARSHALL VEHICLE ENGINEERING SYSTEM (MARVES): The MSFC trajectory oriented computational system, MARVES, has been converted and is now operational on the 1108 computer. This system contains some additional features including the most recent integration forumlae of Dr. Fehlberg and the capability of automatic iteration of desired end conditions. These additional features will also be available on the 7094 computer.

This version of the MARVES system will be installed at Goddard Space Flight Center on September 5, 1967. (See Attached Notes 8-7-67 Hoelzer).

Electronic Research Center and Slidell Computer Center has requested the interplanetary and multi-satellite MARVES programs. Since these installations already have the MARVES system, no effort on our part is necessary.

Personnel of the NIKE Projects Office, Army Missile Command, request the installation of the MARVES system at their computational facility. A formal request is expected in the near future.

H.H. - Who pays for all this? B

1 Attachment: NOTES 8-7-67 HOELZER (DIR and R-DIR's copy only)

NOTES 8-7-67 HOELZER

MARSHALL VEHICLE ENGINEERING SYSTEM: The Computation Laboratory will honor a request received from Goddard Space Flight Center to install at their facility the trajectory oriented computational system developed by MSFC. The Marshall Vehicle Engineering System (MARVES) will provide GSFC a proven tool for solution of problems involving differential equations. The use of MARVES at MSFC has resulted in a considerable reduction in trajectory program development time with a resulting decrease in turn-around time between problem formulation and solution.

NOTES 9/5/67 JOHNSON

Negative report.

NOTES 9-5-67 KUERS

9/5 KA

B 9/11

1. Spray Foam Development: We are engaged in this technology development only for a relatively short time. It is a very complex technology with almost as many variable parameters as in welding techniques. It is also still an art requiring skill and experience. We endeavor to find, by a systematic test program, answers to many questions which are not fully understood yet. Here are some of the areas we are now investigating: (a) The effect of the heat sinks of the skin on the foaming process. We found substantial differences of bonding strength whether the foam is sprayed on thick or thin skin panels. (b) The effect of environmental conditions, i.e., temperature and humidity on the bonding strength. At some extreme conditions of high humidity no bonding strength could be obtained. At Seal Beach, I have been informed, spraying is not done on days of high humidity. (c) Development of foaming equipment with respect to providing proper controls of process parameters such as pressure, temperature, speed and oscillation of the spray gun. (d) Bonding techniques for overlapping areas for close-outs or spraying of several passes or layers. Here we investigate definition of the glue line of foam surface and the effect of thickness of the adhesive film. (e) Material variables of different foams, adhesives, cure times, etc. (f) Inspection techniques. (g) Repair techniques.

I do not want to create the impression that the presently applied techniques for the S-II insulation are not adequate to produce an insulation that meets the design specifications. We are trying to improve the empirically developed techniques by providing a deeper understanding and control of the many factors which affect the final quality of the product. This program is done for support of the prime contractors' efforts at Seal Beach, for support of our in-house task of insulating the Mini-stage, and for development of the technique for the Nuclear Ground Test stages. and the Saturn V program, I hope! B

2. HEMAR Study Completion: The experiments in the neutral buoyancy tank in support of the Human Engineering Maintenance and Repair (HEMAR) study for P&VE were concluded last week. All the various test conditions were included in the completed portion of the study. The test tapes are being processed by the Computation Laboratory for final evaluation by P&VE.

W.K. + Bill Lucas

Frankly, in view of all these many questions and parameters affecting the adequacy of the bonds (and in view of the recent set-backs on the SII-3 insulation at MTF) I feel awfully uneasy about our irrevocable commitment to spray-on foam effective SII-8. B 9/11

NOTES 9-5-67 LUCAS 9/5 KS B 9-11

1. WHITTAKER LOX VENT AND RELIEF VALVE: During the prestatic firing tests of S-IC-5, a LOX vent and relief valve failed (leaked). The leakage was about 0.5 lb./min. The valve was replaced and the test continued. This type of failure at KSC during countdown would cause a launch delay. The valve is at Whittaker for analysis, and a judgement on the possibility of a similar malfunction of the S-IC-1 valve cannot be given until completion of the failure analysis of the S-IC-5 valve. ✓

2. SPRAY FOAM INSULATION TEST (S-II): The failure analysis of the McDonnell/Douglas Corporation tank being used to evaluate the S-II spray foam insulation indicates that the tank was overpressurized and that the failure originated in a repaired fillet weld on the forward bulkhead. Another 8-foot Thor tank, property of the Air Force, has been located at San Diego. The Air Force has indicated that MSFC can borrow this tank (considered flight hardware) but must return it at the conclusion of the test. Preliminary schedule for the new tank would be two weeks at McDonnell/Douglas Corporation for cleaning and proof testing and five weeks at NAA/SD for foaming. A preliminary evaluation of the foam on the tank that failed revealed large areas of debond, but it is not known at present whether these were caused by the test or the incident.

B.L. See Kuers NOTES 9-5-67 B

3. PROTECTION OF IU AND S-IVB AGAINST LM LEAKS: The design of the IU and S-IVB protection was concurred in by KSC. Both IBM and McDonnell/Douglas Corporation are working on detail design. The contractors have recommended the use of "Fluorglass M385-10" (Dodge Fiber Corporation) in a 10-mil thickness. This material is a carbon impregnated (to reduce static charge buildup) Teflon-sized fiberglass and should be quite acceptable for protection of the equipment. Hardware delivery to KSC is expected for 9-20-67. Loading of the LM with water (glycol was eliminated) and Freon 113 was postponed from 9-1-67 to 9-5-67. Elimination of glycol substantially reduces the consequences of leakage. Freon 113 will not prevent the use of the Hazardous Gas Analyzer, but we are advising MSC of our concern about putting this material in titanium tanks. Let's make this hot!! B (Shall I write to Gilruth?)

The current spacecraft disconnect cannot be reconnected if the tank side fails to seal at disconnect. In that event, the S-IVB will catch the full spacecraft load of propellant. Our "raincoat" will not protect against such a failure. MSC is redesigning the disconnects.

4. ORBITAL WORKSHOP FLOOR PLAN: As a result of recent MSC requirements, a complete revision of the basic Orbital Workshop floor plan has been resolved jointly by MSFC, MSC, and McDonnell/Douglas Corporation. ✓

5. NUCLEAR GROUND TEST MODULE (NGTM): Space Nuclear Propulsion Office representatives have formally approved NGTM stage-to-facility Interface Control Documents (ICD's). The three ICD's cover the Upper Service Arm, the Lower Service Arms, and the Fluid Requirements Document. ✓

6. NUCLEAR GROUND TEST MODULE (NGTM) SPRAY FOAM TESTS: The LH_2 container insulated with CPR 385-2 spray foam material (proposed for NGTM) was irradiated to a total dose equivalent to 30 hours of NERVA engine operation and was subjected to repeated cryogenic cycling and acoustic excitation with no apparent deterioration. ✓

NOTES/9/5/67/MAUS

B S-1

FY-68 ADMINISTRATIVE OPERATIONS LIMITATIONS - Manned Space Flight is faced with an FY-68 AO deficit of around $14.0 M. After MSF's first assessment of this deficit the Center's AO ceiling is being reduced $1.2 M from $127.1 M to $125.9 M. Special limitations were placed on personnel compensation, overtime, travel, and minor construction. We are assessing the impact of these limitations, but will attempt to obtain some relief from the individual ceilings since they have greater operational impact than the overall dollar ceiling.

SPACE COUNCIL STAFF VISIT TO NAA AND DOUGLAS - MSF, Field Center Development Office advises that Frank Rand, staff member of the National Aeronautics and Space Council, who visited MSFC in March, will visit NAA and Douglas (Seal Beach, Downey and Huntington Beach) on September 19.

Mr. Rand has asked for "engineering detail" presentations on items produced at each plant, but his schedule permits only about two hours per location. He has indicated a special interest in spacecraft changes following the 204 accident. Arrangements are being made through NAA and Douglas representatives in Washington. We will inform our resident managers of the planned visit.

ON-SITE REVIEW OF MSFC SUPPORT CONTRACTS - On August 21 a Headquarters Team started a review of MSFC's practices with respect to contracting out work and managing its support contracts. The Headquarters Review Team requested that DEP-A provide comprehensive answers to specific questions. In turn, Mr. Gorman asked Executive Staff to conduct an independent assessment of MSFC's practices and report our findings to him within six days. On August 30 Executive Staff delivered its report. Mr. Gorman asked that we give the presentation to the Headquarters Review Team. The conclusions of the Executive Staff assessment are that MSFC management puts support contracts and cost comparison in their proper perspective as an integral part of the total effort. We have concentrated on accomplishing the MSFC mission. A few soft spots were found, particularly in the laboratories, but on the whole we feel we are in pretty good shape.

B 9/11

NOTES 9/5/67 RICHARD

RB 9/5

"Q" Ball Cover: The Kennedy Space Center has accepted the responsibility for the "Q" ball cover. They have been provided with design criteria and will make all effort to have a proven item for flight on AS-502. This tight schedule will require support from MSFC. ✓

A design review will be held on September 11. The Kennedy Space Center is presently favoring a "fly-away" design, fabricated of styrafoam, that will be removed by dynamic pressure prior to the T + 40 seconds required by EDS. The chairmen of the Crew Safety Panels will be available to review the design selected. ✓

NOTES 9-5-67 RUDOLPH

9/5 KS

B 9-11

1. AS-501 Launch Vehicle at KSC:

o The clock spring on the S-IC-5 engine actuators failed during tests at MTF. Results of investigation indicate this failure is a result of carbonization or stress corrosion. Similar actuators, manufactured by Hydraulic Research, are installed on S-IC-1 at KSC. Failure of the clock spring on the actuator could result in a collision between the engine bell and the holddown post at liftoff. Examination of the clock springs requires removal of insulation and other difficult operations which are more time consuming and more difficult than complete replacement; therefore, complete replacement of actuators with actuators from a different manufacturer (Moog) is recommended. (The other stages currently have Moog actuators.)

o A meeting with General Phillips and others is scheduled at KSC on Wednesday, 6 Sept 67, to determine course of action. If actuators are replaced it could delay launch activities as much as one to two weeks.

like 5 days B

o The Confined Detonating Fuse (CDF) Assembly on the S-IC Lox tank, which was jammed in the guide channel while being installed (reported in our 8/28/67 Notes) was removed on Saturday, 2 Sept 67, at the pad. The CDF is scheduled to be replaced on Tuesday, 5 Sept 67.

NOTES 9/1/67 SPEER

9/5/67

B 9-11

1. OPERATIONS MANAGEMENT MEETING: An Apollo Operations Management Meeting was held at PAFB on August 30; lead operations personnel from all participating agencies were in attendance. The presentations reviewed the overall program and no significant problems were identified. The most interesting item was MSC's expressed opinion that we must provide night launch capability for Saturn V/ Apollo. This will be an agenda item at the November Management Council meeting and we should be prepared at this time to discuss MSFC considerations associated with night launches.

2. APOLLO 4 DOD SUPPORT REVIEW: The Apollo 4 DOD Support Review was held on August 31 at PAFB. This review was intended to brief the DOD Commander (Gen. Huston) on DOD readiness to support the Apollo 4 mission. Summaries of detailed technical review meetings held the preceding day were presented. The enthusiasm and desire to support the Apollo program was quite evident and was very refreshing. DOD is ready and able to meet all NASA requirements with the possible exception of the Vanguard Insertion Ship. The Vanguard instrumentation problems have more or less been resolved, but there are both operational and personnel problems to be overcome. MSFC will be supported by an Airborne Light Optical Tracking System (ALOTS) aircraft which will provide camera coverage of launch from oceanside. DOD also considers the S-IC recovery effort as a challenge and is very enthusiastic about recovering pieces. I am now confident that the Apollo 4 support will be very satisfactory.

NOTES 9-5-67 Stuhlinger

B 9/11

1. ATM CONTAMINATION EXPERIMENT: The completed Experiment Implementation Plan (1347 Form), and the Compatibility Analysis by IO (Lee Belew), for the optical scanning photometer and the sample array experiment were handcarried to Headquarters on 8/31. The experiments will be presented to the MSFEB by OART on 9/18. I have been asked by OART (Ginter) and OSSA (Halpern) to be present at this MSFEB meeting to provide information if necessary.

2. ATM-FOLLOW-ON STUDY: In connection with our work on the ATM-Follow-on Study (see Weekly Notes of 8/28, copy attached), Mr. Roland Chase and others from OSSA will visit us next week to prepare an FY-68 budget for the Follow-on ATM experiments. Their visit is prompted by instructions from Mr. C. Mathew's office. Headquarters continues to assure us that there will be a budget line item for Follow-on ATM, if there is a budget for AAP in FY-68 at all. In preparing this meeting, we will work closely with the IO-AAP office.

3. SPITZER COMMITTEE ON LARGE ASTRONOMICAL TELESCOPE: Dr. Spitzer called in connection with his next committee meeting which will take place at MSFC on October 26-27. He requested the following presentations by members of MSFC: (1) Stellar ATM Projects (ASO? SSL?), (2) Orbital Astronomical Support Facility (ASO), (3) Optical Technology Projects (ASTR), (4) Earth Orbiting Space Station (ASO), (5) Tour through Mockup Area (ME), and (6) Tour through Optical Lab and Shop (ASTR).

An agenda will be worked out by the participants. Would you have any particular comments at this time with respect to our presentations? → No. B

4. RELATIVITY EXPERIMENTS: Members of OSSA, ASTR, SSL, and EO visited the places of the two relativity experiments (earth orbit red shift maser experiment by Dr. Ramsey of Harvard, and solar orbit gyro experiment by Dr. Fairbanks of Stanford) during past weeks. The Stanford experiment is still in a status of basic instrument feasibility studies; the Harvard experiment has attained the status of experiment implementation. It is felt that this Center can make very valuable contributions to this experiment during the present phase of experiment definition, problem identification, interface requirements, experiment engineering, systems specification, cost and schedule planning, project organization, etc. An R&DO working group has been established under Dr. Rudolph Decher, Astrionics; this group will work in close contact with the experimenters, with EO, and with Ernie Ott, Project Manager for relativity experiments at OSSA.

Dr. Stuhl.

NOTES 8-28-67 Stuhlinger

1. ATM FOLLOW-ON STUDY: SSL, at the request of IO and with good support from Brown Engineering, is presently conducting the ATM Follow-On Study requested by Jesse Mitchell. Overall study management and interfacing with Headquarters is being performed by IO. Recent changes in guidelines have made our assignment much more involved. For example, we now have three EMR-type payloads to define - EMR-I Option I, EMR-I Option II, and EMR-II or Follow-On EMR. This study is scheduled to be completed by December 1. In the late half of this study effort, Martin, the AAP Integration Contractor, will become involved and make contributions relative to systems analysis and overall mission planning.

2. ATM OPTICAL CONTAMINATION STUDIES: The "ATM Optical Environment Contamination Control and Abatement Plan" has been completed by SSL; it is presently being circulated for concurrence to R&DO Laboratories and IO Offices. The following steps will be taken to implement the Abatement Plan: (a) Contractually make the acceptable/unacceptable materials list a part of the Experiment Implementation Document as a materials guideline, (b) Contractually require submission of materials lists by PI's and subcontractors for MSFC review against the guidelines lists, (c) Discuss and negotiate MSFC opinions as a result of above review, and (d) Implement resultant required changes contractually.

Execution of these steps will be in the hands of Gene Cagle, ATM Project Office, who will work closely with SSL, IO, and Purchasing Office.

3. Ph.D. DEGREE: Larry Wood, SSL, received the Ph.D. degree in physics from the University of Alabama on August 18. His thesis work dealt with a problem of plasma physics.

4. JOINT NASA-AF "THERMAL CONTROL WORKING GROUP": This meeting was organized within NASA by OART and had the written endorsement of Mueller, Newell and M. Adams. It brought out many of the thermal problems of spacecraft projects and of still open research problems. Flight results from satellites or probes beyond the near earth orbits, such as Lunar Orbiter and Mariner, showed a much stronger effect of the space environment than predicted from UV degradation tests in the Laboratory. There was no agreement about the causes of the increased degradation. Solar wind protons and alpha-particles are a very likely cause and should be investigated more thoroughly. Synergistic effects of protons and UV irradiation could also account for the damage. The most space-stable materials used in space projects so far are polished metals covered with an inorganic dielectric thin film or second surface mirrors. The problem here is the lacking technology for large surface application. They were, e.g., ruled out for Pegasus because of the high cost and severe scheduling problems. Another area that found considerable attention is the lack of knowledge of the solar radiation flux. No direct measurement from space has yet been made! SSL has in preparation a flight experiment measuring the solar flux with high precision. We hope that it can be implemented in CY1968.

NOTES 9/5/67 TEIR

OPERATIONAL SYSTEM SAFETY REVIEW: The SA-204 Operational System Safety Review (OSSR) had its first full scale meeting last Thursday at KSC. Jack Lee, who is our chairman of SA-204 OSSR, and some of his key team members presented the detail operation plan that has been written during the last month to members of all organizations concerned and the stage task teams that will be making the detail reviews. The overall safety evaluation phase starts today and we expect to complete the study and have a final report in about 30 days.

SCHEDULE APPRAISAL: With General O'Connor and Dr. Rudolph, I attended General Phillips' scheduling meeting last Thursday at KSC. Saturn IB schedule items of interest were generally as follows: (1) LM #1 is now approximately 37 days behind the last official launch schedule. A new launch schedule will probably be issued this week slipping AS-204 launch by the full 37 days. (2) CSM 101, for the SA-205 mission, is now tracking about 7 weeks behind schedule and earliest possible KSC delivery appears to be about February 15. (3) Consideration is being given to a separate AS-206/LM mission as a contingency mission for AS-204. If this mission is required, it could possibly fly before the AS-205 mission.

General Phillips gave informal approval of our plan to put S-IVB-211 and 212 in storage prior to static test. This should allow us to do required AAP planning for utilization of both stages as S-IVB workshop stages, if required, and later released by the Apollo Program.

FOLLOW-ON NEGOTIATIONS: Contract negotiation to make the Range Safety System Controller has been discontinued with EDP (not an abbreviation) Corporation because of follow-on budgetary restrictions. Negotiations have also been terminated on the following GFE for Saturn IB and V: (1) Command Receiver, (2) Secure Range Safety Decoder, and (3) Exploding Bridge Wire Firing Units.

NOTES 9/5/67 WILLIAMS

9/5/67

B 9/11

1. ASO Participation in Astronomy Meetings. Mr. Ted Carey of ASO has been invited by Dr. Nancy Roman to make presentations at NASA Headquarters as follows:

a. Astronomy Subcommittee Meeting, September 27 and 28, 1967. He will brief the Subcommittee (with models and films) on the Crossed-H Interferometer (Long Wave Radio Astronomy Antenna) and the Focusing X-ray Telescope. Both of these concepts resulted from the recently completed study of Large Space Structures performed for MSFC by General Dynamics. ✓

b. October 9 and 10, 1967 - Meeting called by OSSA inviting prominent X-ray astronomers from universities (MIT, University of California, Wisconsin, Columbia, CIT), industry, and NASA to propose experiments for an X-ray Telescope in the 1970-74 time frame. Mr. Carey plans to present only the Focusing X-ray Telescope work at this meeting. ✓

2. Congressman Karth's Comments on Manned Mars Work. The following comments were made by Congressman Karth in Seattle last week at the AIAA meeting:

Karth said he was "absolutely astounded" at a recent move by NASA to initiate a study of a manned spacecraft designed for reconnaissance missions to Mars in the 1975-77 time period. "A manned mission to Mars or Venus by 1975 or 1977 is now and always has been out of the question, and anyone who persists in this kind of misallocation of resources at this time is going to be stopped .... Not only is effort of this kind at this time a pure waste of tax dollars already in short supply, but it wastes the time and resources of companies which feel that they must respond."

So that you know where we, MSFC, stand regarding these comments: They are not leveled at MSFC activities. Although we were given money and approval to request proposals for Mars studies (MA with 250K to MSFC on August 2), I held all work on them and so informed George Trimble of my action. I felt that such work was not appropriate at this time and could result in much embarrassment. Trimble agreed with my appraisal and action. ✓

SeptemBER 11, 1967

1/67 w/comments Gorman

NOTES
MR. GORMAN'S COPY
SEP 11 1967

w/comments

Belew, Fellows, Geissler
and Johnson notes to
Urgent Box.

NOTES file

2197

NOTE

TO Dr. von Braun, DIR DATE September 18, 1967

FROM Mr. Grau, R-QUAL-DIR

SUBJECT My NOTES of 9-11-67, "S-II Program Batteries"

The Electric Storage Battery Company (ESB) batteries presently on hand cannot be flown. We propose to replace them with additional ESB batteries. ESB is working 24 hours a day to produce acceptable batteries, perform tests, and revalidate. Present schedules will not impact launch date, but it is tight. Eagle Picher Company procurement has been placed as a backup. Qualified batteries are scheduled so as not to impact the launch date.

Dieter Grau

DG

cc:
R-DIR, Mr. Weidner

*ESB batteries are scheduled to be delivered at KSC no later than Oct. 13. Eagle Picher batteries are scheduled for delivery no later than Oct. 10.

2219

DEP-A ACTION TO .....

INFO COPY Gorman, Newby

RECEIVED OCT 11 1967 DIR

RECEIVED DEP-A

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

1967 OCT 9 PM 12 21

Memorandum

TO Mr. Gorman, DEP-A

DATE OCT 5 1967

FROM Chief, Manpower Utilization and Administration Office, MA-CH

SUBJECT von Braun notes of September 11, 1967

file attached

Notes to Dr. von Braun on September 11, 1967, from Scott Fellows indicate a critical shortage of clerical/secretarial support at the Center. On August 22, 1967, this office received a memorandum from Scott Fellows indicating that Research and Development Operations was short 52 clerical personnel of what they considered a minimum total clerical work force. Since that time, they have continued to lose clerical personnel, and we now estimate that they are approximately 75 below their needs. It is expected that the clerical turnover rate will continue to be higher than other types at the Center. To remove some of the pressure on this situation, Personnel Office has been authorized to hire 99 YOC students. These spaces are being filled by students who are pursuing a clerical curriculum in high school. Most of these have minimum typing speeds.

NOTE!

Dr. Geissler indicated, in his notes to Dr. von Braun, the loss of several employees with Ph.D. degrees. All of these employees have accepted teaching positions at universities. During their exit interviews, all of the employees expressed satisfaction with employment at Marshall except Dr. John George. Dr. George considered that he was underpaid and indicated that, if he were starting his career over, he would start with private industry. A review of Dr. George's file indicates the following: Hired in 1957; 32 years of age; B.S. degree from Purdue; employed as GS-5 in August 1957; and promoted to GS-7 in 1958, GS-9 in 1959; GS-11 in 1960, GS-12 in 1961, GS-13 in 1962, and GS-14 in 1964. In addition to promotions received, Dr. George received his M.S. and Ph.D. degrees while employed at Marshall. Dr. Scoggins was well pleased at Marshall, but desired to teach. His salary at Marshall was $18,764. He accepted a position at Texas A & M at $17,400. Dr. Liu also desired to teach. He indicated that his family had all been teachers and that this was his life-time ambition. He had been employed part time at the University of Alabama as a teacher while employed here. Dr. Farmer considered that he was fairly paid here and seemed reasonably pleased with his position. He accepted a teaching position at LSU.

Even though we consider that these men preferred teaching, Dr. Geissler has pointed out an area of concern. So long as we have a ceiling on the

number of GS-14's and above that the Center may employ, we will stand the possibility of losing employees who have been approved for higher grade jobs but cannot be promoted because we are against the ceiling. The ceiling of 1226 is realistic (about 30% of the total employees in the type jobs that can go as high as GS-14). More positive action by line supervisors to reduce in grade those employees who are GS-14 and above but not performing at that level would help.

M. Keith Wible

M. Keith Wible

NOTES 9/11/67 FELLOWS

B 9/17

9/13 RD

1. MSFC/KSC Mutual Assistance Program: During the past week, 1 additional name has been submitted to KSC for their consideration, which brings the total of MSFC nominees to 71. Also, during the week, 1 more individual was selected by KSC, bringing that total to 29. With the departure from Huntsville of another man, there are now 26 who have actively participated in this program. The first terminal report by an MSFC man, in accordance with the inter-Center agreement, has been received. Those reports will be accumulated and a summary report made to your office shortly after the 501 launch. ✓

2. R&D Operations Travel Money: The combination of reduced funding and heavy requirements for travel has resulted in an increasingly critical appraisal of the priorities of travel requirements. The result is that all really necessary travel in support of AS-501 will be supported and, by a continual joint appraisal in R&DO, essential travel required by other high-priority programs can be performed, although each trip must be in the near-critical category, at least through the remainder of this quarter (through September) ✓

3. Secretarial Support: The secretarial situation has become the first wide-spread category to become truly acute during this period of reduced personnel ceiling and freeze on hiring. Since it is well-known that the clerical turnover rate is substantially higher than for other types of personnel, this situation was not unexpected. The results, however, are interesting. One visible result is that, due to replacement of secretarial vacancies from within R&D only, the musical chairs game has provided promotions for on-board secretaries to the point that applicants for the lower secretarial grades are almost nonexistent. A result with far less visibility is the price being paid, in some instances, because of the lack of secretarial assistance and more senior people devoting part of their time to filing, scheduling of meetings, writing memos by hand, etc.

Harty ↗

As expected and often discussed!

B

2207

MSFC ROUTING SLIP

	CODE	NAME	INIT.	☐ ACTION	☐ INFORMATION
1	DIR	Dr. von Braun			
2					
3					
4					

SEP 26 1967 DIR

REMARKS

The attached is forwarded in response to your question on my notes 9/11/67 (copy attached).

CODE	NAME	DATE
I-E-MGR	W. D. Brown	9/26/67

MSFC - Form 183-1 (July 1966)

MSFC ROUTING SLIP

	CODE	NAME	INIT.	☒ ACTION	☐ INFORMATION
1	I-DIR	General O'Connor			
2					
3					
4					

REMARKS

1. The fix we had planned for the J-2 LOX seal leakage for 501 might not work. Other alternates are being considered, but the final fix remains open, and might still be open at CDDT. Be assured we have maximum horsepower going toward a solution.

2. At the last Management Council Meeting, Dr. Mueller suggested to Dr. von Braun that we look into a simple design to vent LOX seal leakage overboard by a line direct from the bottom of the engine thrust chamber to the stage skin. This type design was considered by R&DO two years ago and was not considered feasible due to the line break-away forces at separation which imposed excessive loads to the engine. Another look has been taken by R&DO at this design since the Management Council Meeting.

3. Dr. Lucas will provide a status memorandum on this task on Monday or Tuesday.

4. On Friday afternoon, Lee James discussed the problem with Sonny Morea, in preparation for a briefing with General Phillips who was subsequently to brief Dr. Seamans.

cc: I-DIR, Mr. Hueter

ORIGINAL SIGNED BY
WILLIAM D. BROWN

CODE	NAME	DATE
I-E-MGR	William D. Brown	9/15/67

MSFC - Form 183 (Rev. February 1961)

9/11 NOTES file

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO Mr. Brown, I-E-MGR DATE Sept. 25, 1967

FROM Director, Propulsion and Vehicle Engineering Laboratory, R-P&VE-DIR

SUBJECT J-2 engine LO_2 pump seal bleed system overboard drain

1. We have considered routing the drain line from the engine across the separation plane to the lower stage bulkhead and thence to the outside through the forward skirt. This consideration was found to be impractical for the immediate vehicles because of the following reasons:

a. There are no flight qualified configurations for a fluid/pneumatic stage-to-stage separation system for the Saturn IB and V vehicles. In fact, there are no lines other than electrical cables that go across the separation plane.

b. The disconnect load effects on the engine, stage bulkhead and stage separation dynamics were unknown and would require extensive testing and analysis to qualify.

c. This concept would involve additional failure modes.

2. The current configuration that crosses the engine customer connect panel and is routed overboard through the stage utilizes qualified components in the engine and a proven concept for the engine to stage interface.

3. The teflon duct material has been certified for flight use on the AS-501 vehicle as a result of cryogenic vibration testing performed by MSFC, McDonnell Douglas Corporation (MDC) and North American Aviation/Space Division (NAA/SD).

4. We understand that Rocketdyne has a pump seal modification that would reduce the leakage significantly and could be incorporated at an early vehicle effectivity.

W. R. Lucas

W. R. Lucas

cc:
I-E-J, Mr. Morea
I-I/IB-SIVB, Mr. McCulloch
I-V-SII, Mr. Godfrey
R-P&VE-PA, Mr. Thomson
R-P&VE-VSA, Mr. Genter

NOTES 9/11/67 JOHNSON

9/13 JS

B 9/17

OMSF Supporting Development Program - In a review of the MSF POP 67-2, recommendations were made to Dr. Mueller to cut the FY68 Supporting Development funding to $16M. However, he elected to leave the level at the originally planned $32M, but directed that the Apollo Program be reviewed to identify high priority items of a supporting research nature currently being funded from mainstream sources. The J-2 T (toroidal) work at Rocketdyne appeared to be of particular concern to him. On 9/6, Messrs. Waugh, Mallament, and Williams of Mr. Trimble's Office met with Messrs. Cook, Fellows, Morea (Engine Office, Sneed (SAT V), and Miles and me to discuss the program. Waugh's interpretation of the Mueller direction is an effective cut to $16M in the already submitted Supporting Development program, to be made up by a $16M program of items to be identified from currently planned sustaining engineering and Apollo General Support programs. He apparently sees this as (finally) the lever to get the easier to defend, absolutely required quick fix research items, normally supported directly by the program managers, under his direction. The local position currently is that subjecting such items to the task by task review and approval route in HQ. and putting them into a program with a history of low stability of funding is not desirable.

Harry J. This seems to be a major aspect of this growing Hq. interest in more detailed "Work Packages" B

Mr. Miles, in conversations with members of Mr. King's Office (Engine Group of Apollo Test Directorate) on 9/7, learned that they had been directed (source of direction not known) to reduce their '68 budget by $16M in the J-2 area.

We will continue to accumulate information and, working with IO, prepare a briefing and recommendation of position to give you by early next week. ✓

MSF Experiment Review Panel Actions - At a meeting of the Panel on 9/7, the MSFC proposed flight test of the Strap-Down Platform was recommended for approval and presentation to the MSFEB in their November meeting. This approval was conditional by a request for information to be derived from a comparison of the MSFC platform with a unit currently under development by TRW for MSC. We anticipate no problem. TRW assisted in the definition studies for the MSFC unit, which is about an order of magnitude more precise than is the MSC model. The MSC model is for relatively immediate spacecraft use and is developed against fairly nominal precision requirements. ✓

NOTES 9/11/67 BELEW

B 9/17

9/13 NS

ORBITAL WORKSHOP (OWS) SUBSYSTEM REVIEWS: The OWS subsystem reviews (i.e., mobility aids, thermal curtains, tank penetration mods) have been scheduled to start Wednesday, September 13, 1967. Those subsystems which were not affected by recent changes to the crew quarters will be reviewed first. All subsystem reviews shall be completed by September 22, 1967. The reviews are intended to provide Authority to Proceed (ATP) for McDonnell Douglas Corporation (MDC) to do detail subsystem design in preparation for the delta Preliminary Design Review and Crew Walk-Through. ✓

ORBITAL WORKSHOP TEST PROGRAM: A letter has been received from MDC, recommending a new approach to the OWS test program which more or less eliminates NASA participation in the tests. This letter is being reviewed by IO/R&DO to determine its impact on the OWS test program. A delay in issuing the general test plan will probably result. MDC states now that a 50% cost increase and a substantial schedule impact will result if the test program is conducted as the MSFC has proposed.

APOLLO TELESCOPE MOUNT/LUNAR MODULE (ATM/LM) CONTROL AND DISPLAY MOCKUP: Lockheed Missile and Space Company's LM control and display mockup has been moved from their facilities to Building 4755. Even though Lockheed built the mockup on their own, they have no further need for it and have given it to MSFC ✓ for continuation of control and display development. ✓

Skep
Let's visit it
B

ATM HCO-C EXPERIMENT: The supplemental agreement to cover the definition phase of the Harvard College Observatory (HCO) "C" experiment has been signed by HCO and returned to MSFC. Signing of the contract by MSFC and transfer of partial funds will be completed by September 11, 1967. ✓

NAVAL RESEARCH LABORATORY'S (NRL'S) REDUCED EXPERIMENT PROPOSAL FOR ATM: NRL's proposal for a reduced experiment to be flown on the first ATM flight has been received. R&DO is currently performing a technical evaluation of the proposal. ✓

PHASE "C" CONTRACT EXTENSION: The revised proposal was received this week from Martin Company for extension of Phase "C" to November 30. It will be negotiated September 18. Submittal of Phase "D" Work Plans has been deferred until September 20. ✓

SPACECRAFT LAUNCH VEHICLE ADAPTER/NOSE CONE (SLA/NC) JETTISON: Analysis has shown that a potential payload increase of approximately 2,600 pounds can be obtained by jettisoning the SLA Panels and Nose Cone very soon after S-IVB ignition on the OWS and ATM flights. The scheme currently being considered is a "one piece" jettison with the separation plane at the existing hinge line using the Launch Escape System (LES) Tower Jettison Motor mounted to the existing MSFC Nose Cone. The MSFC analysis which indicates that a minimum clearance of about 9 inches can be expected has been provided MSC for their review. ✓

L.B.,
Request briefing on this scheme
B

B 9/17

NOTES 9/11/67 BALCH
9/13 TS

S-II-3 Testing - The LOX/LH_2 tanking test was accomplished on 9/6/67 as rescheduled. During chill-down of the LH_2 tank, a section of insulation sidewall about 4 feet by 6 feet in size debonded, and several other minor insulation failures occurred. LH_2 tanking was continued to the 10% level in order to accomplish most of the objectives of the tanking test and then terminated. No other major problems were encountered. Because of insulation repairs and incorporation of Rocketdyne engine modification, first static firing has been rescheduled to 9/19/67.

S-IC-5 Stage - Removal of stage from stand, previously scheduled for 9/6/67, was delayed because of additional engine work required by Rocketdyne. Stage is being removed from stand today and is to be shipped to Michoud tomorrow.

S-IC-6 Stage - Date for delivery of stage to MTF is still indefinite pending receipt of revised S-IC test program schedule, which is expected to be finalized by the MSFC stage office this week.

GE Service Contract - Negotiations with GE on the CPAF proposal covering the second through fourth quarters of Fiscal Year 1968 were concluded on 9/7/67. The negotiated estimated cost is $22,836,400, with base fee of $350,000, potential award fee of $1,650,000, and maximum fee of $2,000,000.

NOTES 9-11-67 BROWN

9/13 JS

B 9/17

H-1 ENGINE Inspection of LOX/Lube seal cavities on S-IB-5 has been completed. All engines are satisfactory. All engines have now been inspected except for those on S-IB-6; these will be inspected as soon as the stage can be removed from storage. ✓

F-1 ENGINE After static testing of S-IC-5 at MTF, parts of the turbine inlet temperature thermocouple were found to be missing. This thermocouple is located at the outlet of GG and is used as a redundant red line measurement for static firings. The thermocouple was designed by Boeing. General Electric is the vendor. This measurement is used only for static firing and is not a part of the flight instrumentation. Inspection of the engine by Rocketdyne revealed that the wire and ceramic had apparently passed through the turbine and heat exchanger leaving only minor scratches. ✓ The thermocouple sheath (1/4" diameter × 1 3/4" long stainless steel tube) was found lodged in the nozzle block of the turbine and was removed. Upon reassembly of the turbine and heat exchanger, we consider this engine satisfactory for flight. ✓

During cutoff and malfunction test on S-IC-1 at KSC, the ignition monitor valve on engine F-3011 was overpressurized at 150 psi (max allowable 100 psi) for approximately thirty minutes due to an apparent malfunction of the hypergol test tool. A valve integrity check will be conducted per the engine maintenance manual. It is anticipated that valve replacement will not be required. ✓

J-2 ENGINE Reference my notes of 8/21, 8/28 and 9/5. The LOX pump seal leakage venting during the boost phase is not yet completely resolved for AS-501. Testing at Tullahoma on the vent line configuration now installed on AS-501 revealed a pressure of approximately 5 psi in the engine vent line during engine run. This pressure apparently is caused by a velocity head being developed in the vent line as a result of the line's having been extended slightly into the engine exhaust to permit rapid burn off of the vent line closure. If this pressure is confirmed by additional testing, this means that during engine run, hot gases could flow from the engine vent line back through the new overboard engine/stage vent line. (This is the line which was added for overboard venting of seal leakage during the boost phase.) Backup designs which should eliminate this velocity head are in testing. One incorporates a burst diaphragm which eliminates the need for the vent line to extend into the engine exhaust. The other incorporates a melt-off cover over an opening on the downstream side of the vent line end. The latter is expected to reduce the pressure to less than 1 psi, which may be acceptable. Fortunately, the engine drain line has a B-nut near the engine exit so changeout of drain line ends is no problem. ✓

Bill Brown Did you look into the feasibility of the vent lines connected to (and released with) the SIC-booster? I'm referring to the proposal FEM made at KSC recently. B

URGENT

NOTES 9/11/67 CONSTAN

9/13 NTS

B 9/17

CCSD APPEAL

CCSD, by letter of September 6, 1967, is appealing the decision of the Contracting Officer regarding reduced mission of S-IB-3 flight. The appeal has been forwarded to the NASA Board of Contract Appeals. ✓

60-DAY EXTENSION FOR FOLLOW-ON EFFORT

Authorization in the amount of approximately 1.6 million has been granted for CCSD to continue long lead time material procurement on a limited basis for an additional sixty days in order to maintain schedule continuity for Saturn stages S-IB-13 through S-IB-16. ✓

CRACKED SOLDER JOINT PROBLEM

All telemetry packages have been removed from Saturn stages S-IB-5 and S-IB-6 for inspection regarding cracked solder joints. Three TM packages have been inspected and cracked solder joints have been discovered on one printed circuit board to date. ✓

NOTES 9-11-67 GRAU

9/13 KS

B 9/17

S-II PROGRAM BATTERIES: The Electric Storage Battery Company (ESB) attempted to requalify the S-II batteries after a change order was issued to SD requiring that they change the specific gravity of the electrolyte and thermostat setting to correct a low voltage problem discovered during quality maintenance testing. During the requalification testing of four type II batteries, two batteries failed during random vibration, one at 120°F and one at 65°F. Analysis of the two failed batteries has indicated that the lug wires in several cell jars in each battery had broken causing the batteries to go dead. In addition, six batteries were being tested for satisfactory operation of their modified thermostats and two of these batteries failed as their thermostats failed to operate. SD and ESB are currently involved in an extensive failure analysis investigation program at ESB to determine the cause of these failures. Since we do not have qualified batteries for the S-II stage, 501 vehicle, SD has initiated a procurement action with the Eagle Pitcher Company for fifteen batteries which include four qualification test batteries.

D.F.

URGENT → Do you suggest to replace the ESB's in SII - 501? Any impact on test program, revalidation needs, launch date?

B

NOTES 9/11/67 HAEUSSERMANN

B 9/17

9/13/68

1. SA-501 Hydraulic Research Actuator Change. The actuator change was completed Sunday 10 September and G&C flight simulation reverification is planned for today. Three representatives from R&DO were sent to observe the actuator change; two from Astrionics and one from Test.

2. ATM Pointing Control. At the ATM quarterly review on 7 September, Langley made a presentation on the merit of using the "Langley Control Law" on ATM. We have given serious consideration to this control approach since the outset of the program. Other control laws (namely the "Cross-Product Law" and "H-Vector Law") have also been considered. On 4 May, after a careful evaluation of the various approaches at MSFC and Bendix, a decision was made to use the H-Vector Control Law as the prime approach on ATM.

Our studies showed a cross-coupling problem with the Langley Law, whereas the H-Vector Law provides at least a 10 times better pointing accuracy about axes orthogonal to the disturbed axis. Implementation of the H-Vector Law is slightly more complex and either of the other two approaches are merely hardware simplifications which can be reverted to at a later date in case future studies show this to be desirable. Flexible body studies are now underway and a status report on these studies relative to bending filter design philosophy (high pass or low pass) will be presented to you at the meeting on "Cluster Dynamics" presently scheduled for 22 September.

3. ATM Thermal Control. Since you could not be at the ATM quarterly review when thermal control was covered, I am summarizing the present status.

a. The original approach of active heating with passive cooling can do the job for the simplified or sophisticated experiments.

b. An active cooling system will be more costly, take more time to develop and be less reliable. Active cooling does provide flexibility and if the power requirements of the experiments were significantly increased, a cooling system would be necessary.

c. The active heating system will provide for a cannister wall variation of plus or minus 3°F (which is better than the PI's/Ball Brothers original request). Even with this smaller variation, Ball Brothers has now acknowledged that thermal control (active heating) of the NRL and Harvard experiments is necessary.

Phil Culbertson (representing Mr. Mathews) stated that the data presented would be passed up the line (Dr. Mueller/Mr. Mathews) and it is their choice as to whether a presentation to Dr. Mueller is necessary. Mr. Culbertson directed MSFC to continue the detailed engineering implementation of the active heating system.

4. ATM Quarterly Review & PI Meeting. We were encouraged by the informal comments of some NASA Headquarters personnel in that they were pleased with what they heard during these two reviews. It also became apparent to Headquarters during the review that MSC is designing their hardware to consider the mission open ended (up to 56 days and not considering the revisit requirement) whereas MSFC has been considering these as firm requirements and is attempting to make the ATM designs accordingly.

NOTES 9/11/67 HEIMBURG

9/13 TS

B 9/17

S-II-3(MTF)

A lox - LH_2 tanking and static firing mode sequence test were accomplished on September 6, 1967, on S-II-3 at the new A-1 Test Stand at MTF.

Preliminary data indicates successful conduct of the test objectives with exception of the sidewall insulation blowdown and LH_2 tanking to 100% level which were deleted when a large piece (6' x 4') of the sidewall facing sheets peeled off exposing the honeycomb and insulation. The insulation purge outlet pressure dropped to 0.3 p.s.i.g.

S-IVB TEST STAND (MSFC)

A lox and hydrogen loading was accomplished on September 6, 1967, to investigate the depletion level sensor cycling. A second loading test is planned for September 12, 1967.

H-1 ENGINE (MSFC)

Test PI-507 was conducted at the Power Plant Test Stand on September 8, 1967, using engine No. H-1-156-4D. This was a checkout run on the engine received from Rocketdyne (Neosho) which had demonstrated instability on that facility. Next test today will be a bomb test to see if the same thing happens on this facility.

NOTES 9-11-67 HOELZER

9/13 KS

B 2/17

NEGATIVE REPORT.

NOTES 9-11-67 KUERS

9/13/67

B 9/17

Study of Zero "g" Locating and Handling Tool:

In a terrestrial plant, the force keeping things in location is provided by the friction of the floor resulting from their weight. In a space facility, this specific function of a floor disappears because of the missing weight. Mechanical locating and handling devices are needed to take over the "floor function." One zero "g" handling system consisting of multiple links, which we studied, is the Serpentuator. Two distinct categories emerged, one for longer range as needed in extravehicular activity and one for short range up to 20 feet for use inside the orbital workshop. Multi-link devices in general require a feedback system and rate control of the angular motion between links in order to be controllable. The need for such a complicated control system can be avoided by sequencing so that only one link moves at a time. Furthermore, restriction of freedom between links to a single plane motion and only one gimbal joint at the attachment base allow the free end to reach each point in a spherical motion volume. Just two steering modes provide sufficient flexibility by either starting the link motion from the base gimbal end or from the free end. The free end can be flown from one position to another by remote or direct stick control.

The storage modes during powered flight into orbit and the deployment and operational storage position of the Serpentuator have also been resolved to a practical level.

The free end force which the Serpentuator can produce ranges between two and twelve pounds for 100-foot length, which offers sufficient locating and acceleration force for zero "g" manufacturing operations. A number of electro-mechanical and electro-hydraulic hinge designs were studied. Space compatible versions would need only slight modification of an available test model consisting of five links.

The short Serpentuator type for intravehicular use must provide for hinge angle between links up to $\pm 180^{o}$ in order to be more flexible for packaging and use in small areas. It uses visual control, which the operator can likely provide for short distances.

The Serpentuator principle is presently under consideration for the ATM film cassette removal. P&VE is coordinating the study with IO and MSC.

NOTES 9-11-67 LUCAS

B 9/17

9/13/67

1. S-IC WHITTAKER LOX VENT AND RELIEF VALVE FAILURE: (Re: Notes 9-5-67 Lucas) A broken spring which had kept the lip seal from seating was found in the valve. This is the first time this spring has failed. A redesign and requalification could cause slippage in 501 schedule. Disposition has not been made yet. !!!

2. S-IC LOX VENT VALVES INTERLOCK: We prepared an ECR to remove the open position indication of both S-IC lox vent valves from the interlock logic that allows S-IC lox fill to start and continue. This change will permit manual control of the vent valves during the lox loading operation. This is a temporary fix for AS-501 to resolve the problem caused by negative pressure spikes in the tank. A permanent fix is being studied for SA-502 and subsequent vehicles.

3. PM/RACK: Cancellation of the LM&SS program as a part of NASA activities has resulted in termination of major effort in the PM/RACK program. Assembly of one RACK will be completed and we will use this one in the ATM test program. All other PM/RACK structural parts, materials, and tooling not usable in the ATM program will be stored pending receipt of further direction.

4. ATM THERMAL CONTROL: At the ATM Quarterly Review, 9-7-67, the liquid system and the electric heater system located on the experiment can were discussed in detail. Both systems can provide 70 $\pm$ 3°F can temperatures and have adequate margins. The liquid system has more flexibility and can provide a 55 $\pm$ 3°F can temperature. This temperature range may be required to achieve a compatible environment for all experiments. The electrical heater system was accepted contingent upon resolution of present incompatibilities between allowable environments for various experiments.

5. S-IC-5 ENGINE IS INSPECTED: A turbine inlet temperature transducer failed in Engine 2041 during the 8-25-67 static firing. A portion (approximately 1½ inches long and ¼ inch diameter) of the failed transducer was found in the turbine manifold above the turbine nozzle block. No additional damage had been incurred.

6. THIN FILM DEPOSITION: A new process for vapor depositing thin films of non-metallic materials (Teflon, Al_2O_3, BeO, etc.) on metallic substrates or other thin films has been developed by our Materials Division. The process is a room temperature sputtering technique that results in a tough, continuous film (500-1000 Angstrom units in thickness). These techniques should have wide application for solid state electrical devices, dry film lubrication, thermal control coatings, etc.

7. AAP COROLLARY EXPERIMENTS: Astronaut Jack Lousma was briefed on the status of AAP corollary experiments by laboratory personnel on 8-31-67. His greatest interest was in the optimization of all attach and supporting devices for experiments, considering maximum utility, simplicity, and commonality.

B.L.

Hope we have applied for NASA patent. Inventor is eligible for some remuneration, if patent is granted

B

NOTES/9/11/67/MAUS

9/13 9:15

B 9/18

HEADQUARTERS/CENTER UNIVERSITY CONFERENCE - A review of NASA's total University Program will be held in Washington September 13-15. In addition to the usual participation of University Affairs, OSSA, OART, and OMSF, each Center has been asked to present a one-hour review of their university program to the Administrator. The primary objective of the review is to provide better visibility into NASA/university activities and to evaluate results to date and value received from NASA's investments in universities. Significant to this review is the impact of the budget cut for the Sustaining University Program from a current level of $40M to $10M in the current FY-68 appropriation bill. MSFC presentation will be made by Jim Dowdy and Dr. Russ Shelton. A dry run to Mr. Gorman is scheduled for Tuesday, September 12 at 1:00 p.m. ✓

WORK PACKAGE PLANNING AND CONTROL SYSTEM - OMSF has requested the centers to implement a "Work Package Planning and Control System" which would apply to both civil service and support-contractor manpower. This system would require the centers to identify, by schedule and work description, all work units with the unit size averaging no more than 30 to 50 people.

We have completed the MSFC initial review and Mr. Burks handcarried our reply signed by Mr. Gorman to Washington on September 7, 1967. Our basic position in this reply was that we generally concurred in the proposal for new and/or starting efforts; however, we do not feel it practical that the new system apply to the Apollo Program. ✓ Our reply also described our current Manpower System and requested that a briefing team from OMSF further brief MSFC in advance of any implementation.

MSC, in their reply to OMSF, stated that the work package concept was being incorporated into their manpower utilization system but that they had incurred a problem of relating the system to the agency accounting coding structure. ✓

KSC, in their reply, endorsed the objective of the system, but recommended that a team consisting of members from all three Centers and OMSF review the system to insure that it is mutually feasible. KSC said the OMSF's proposed system required considerable exploration and refinement before it could be operational. ✓

B 9/12

NOTES 9/11/67 RICHARD

9/13 9:15

Interface Meeting: MSFC will be the host Center for an inter-Center meeting on September 13 with KSC, MSC, and NASA Headquarters to review inter-Center interface activities. Discussions will center around procedures for the inter-Center AAP repository, the inter-Center Control (ICD) Log, and related matters. ✓

NOTES 9/11/67 RUDOLPH

9/13

B 9/8

AS-501 Launch Vehicle at KSC:

- The Hydraulic Research engine actuators on the S-IC-1 Stage (same as the actuators which had a clock spring failure on the S-IC-5 Stage at MTF) have been exchanged for Moog, Inc., actuators.

- This change caused a four day delay in the AS-501 pre-launch checkout schedule. Revised schedule is as follows:

  - Countdown Demonstration Test — 23-26 Sept 67 ✓
  - Flight Readiness Review — 28-29 Sept 67 ✓
  - Flight Readiness Test — 4-5 Oct 67 ✓

S-II-3 Stage at MTF:

- During cryogenic tanking test, on Wednesday, 6 September 67, a 4' x 6' piece of insulation delaminated from tank.

- Due to this problem, the LH_2 was only loaded to 10% level.

- Insulation repairs and other work have caused first firing to be delayed 7 days (from Tuesday, 12 Sept 67 to Tuesday, 19 Sept 67). ✓

Colonel Sam Yarchin is leaving:

- I mentioned some time ago that Colonel Yarchin, our S-II Stage Manager, was planning to retire from the Air Force. His plans are completed and he will now be leaving MSFC about 25 September 67, take a month's leave, and officially retire on 31 October 67. He plans to live in California and work for private industry. ✓

- Mr. Roy Godfrey will be appointed S-II Stage Manager. ✓

NOTES 9/11/67 SPEER

9/13 NB

B 9/12

1. APOLLO 4 FLIGHT MISSION RULES REVIEW: Gen. Phillips and Mission Director W. Schneider conducted the second part of their AS-501 mission rules review on 9/7 at Headquarters (the first part covered the Launch Rules and was held on 8/22 at KSC). We had anticipated a very detailed technical review of each single item and were prepared for all L/V related items. It turned out that Gen. Phillips was satisfied with a general coverage of all principal contingency actions presented by Flight Director Lunney. No disagreement and no major change on any rule developed during the meeting. Noteworthy results: (1) Pad fallback and tower collision will not result in S/C abort; the earliest abort capability will be at 25 sec flight time; (2) Gen. Phillips stated a requirement for a crew initiated L/V cutoff capability on all manned flights; (3) Complete loss of the S-IVB hydraulic system prior to restart will require inhibit of the 2nd burn since the resulting actuator position of 4.4 deg would lead to a loss of S/C attitude reference before ground command action could be taken (this is in addition to the actuator hardover case discussed previously); (4) After some discussion it was reconfirmed that no S/C failure would be considered cause for 2nd burn inhibit. ✓

F.S. → Does this mean that astronaut-initiated abort in case of pad fallback is not possible during first 25 sec?? What's the rationale? B

2. AS-501 SUPPORT: Preparations of the Huntsville Operations Support Center (HOSC) for support of the AS-501 Countdown Demonstration Test (CDDT) are essentially complete. Identification of support engineers has been completed. You will receive listing of all names today. The HOSC will be fully manned during the terminal count (T-14 hr) of the CDDT by both MSFC and contractor engineers. During the Flight Readiness Test and any other prelaunch activity our support personnel will be on call as required. Dissemination of final instructions to personnel will begin this week, with support engineers briefings planned for September 20 and 25. Mission status dissemination and training simulations for operations coordination personnel will begin next week. ✓

NOTES 9-11-67 Stuhlinger

B 9/18

9/13 RD

1. ASTRONOMY COURSE: Dr. Abt (Kitt Peak) and Dr. Pesch (Case Institute) taught a 4-day course in stellar astronomy last week. About one hundred members of MSFC participated. The lectures were excellent. ✓

2. ATM-FOLLOW-ON STUDY: Mr. Roland Chase and Dr. Leslie Meredith from OSSA, and Mr. Lutkefedder from IO, spent a full day with SSL to receive an interim briefing on our ATM-Follow-On Study work, and to discuss FY-68 funding possibilities for ATM-Follow-On projects. According to Mr. Chase, the funding situation for these projects does not look unfavorable, even based on a 300 M AAP budget in FY-68. optimistic!! B

3. CLUSTER FOR STELLAR ASTRONOMY: Our ATM-Follow-On Study effort brings to light a very interesting problem which can probably be circumvented for EMR, but not for the more demanding stellar astronomy satellites. This problem concerns the orientation of the cluster. It seems relatively certain that the cluster will be sun-oriented during the daytime portion of the orbit, since the solar cell arrays must face the sun. Upon leaving the daylight portion of the orbit, the cluster can be reoriented to acquire various celestial targets of interest, but of course the cluster must again be reoriented to the sun when coming out of the earth's shadow. Slewing of the cluster consumes valuable mission time and is expensive from a propellant utilization standpoint, particularly since the moment arms and masses which are involved in the cluster complex are so large. Under such conditions total observation time on any celestial target may be limited to only a few minutes per orbit! This situation would lead almost naturally to a consideration of the possibility of separating the LM/rack system from the cluster for stellar observations. We will discuss this situation, and various possibilities of a solution, with P&VE and SEO. There are indications that MSC would look unfavorably at a detached mode of operation. However, detaching the LM with two astronauts for some time during orbital flight should still be far less difficult than detaching the LM with two astronauts for a lunar landing, ✓ and subsequent orbital rendezvous. ✓ We will suggest a technical interim briefing on our studies to H. Weidner in about three weeks. Would you like to attend this briefing?

4. INFRARED ASTRONOMY: Drs. Abt and Pesch reviewed our experimental work in infrared astronomy. Dr. Abt suggested that we should submit some of our projects to the Director of Kitt Peak with the request for time on Kitt Peak telescopes. Dr. Pesch indicated that he will encourage undergraduate and graduate students from Case Institute to work at our laboratory next summer. ✓

5. NAS-NRC FELLOW: Dr. Konesh Yerneni (from India), a resident post-doctoral research associate of NAS-NRC, joined the Thermal Environment Physics Branch of SSL on September 6. He will be working mainly in the molecular spectroscopy field. ✓

6. MEMORANDUM OF UNDERSTANDING: Kodak requested this memo to protect its proprietary rights in releasing experimental films and processing data in connection with our contamination study. The agreement which had been drafted by SSL for MSFC and Kodak has received legal approval from the Chief Counsel of MSFC and Headquarters. It cleared its final obstacle this week when it was found acceptable by the Office of Industry Affairs. This proposed agreement will be submitted to you and to Kodak for signature. ✓

Yes, with your response to ① and ②

① This is a MUST in my opinion!

② Only if astronauts are on board, and maybe they should!!!

NOTES 9/11/67 TEIR

9/13 KS

B 9/18

AS-205/CSM-101: As you are aware, we have been weight critical with the CSM-101 for AS-205. MSC has recently decided to utilize an $\frac{L}{D}$ of approximately .25 which is the same as that planned fot the lunar mission. This will permit a reduction in the required command module ballast which will help alleviate the performance problem for the AS-205. The amount that can be off loaded has not yet been accurately determined but any reduction will help, since our present margin is just about equal to the three sigma flight performance reserve. ✓

INSTRUMENTATION PARTS AND COMPONENTS LIST (IP&CL) CONTROL: We held a joint meeting with Saturn V, Astrionics, and the prime contractors on September 7 to discuss the procedures to be employed for placing IP&CL's under adequate control. It was our conclusion that the IP&CL's should be placed under Interface Control Document (ICD) type control. We are currently preparing a joint Saturn IB and V program implementation directive which will be distributed at an early date. ✓

ORBITAL WORKSHOP MOCKUP: The orbital workshop mockup was returned by Super Guppy to McDonnell-Douglas Corporation on September 5 for rework. ✓

UNIT LOGIC DEVICE (ULD) PROCUREMENT: We are reaching a critical point in the procurement of ULD's for the follow-on program. As a result of Mr. Dorman's TWX (following Webb's budget meeting with the Center Directors) to Mr. T. V. Learson (IBM Corporate President) on reducing FY 68 costs, IBM's current planning calls for phasing out their ULD production unless they get a go-ahead for additional LDVC/LVDA's by September 15. We are investigating this further with the objective of taking the most economical approach that will retain the capability of giving us high performance ULD's for the follow-on program.

Ed O'C.

Looks unacceptable from all aspects, as long as there are any follow-on buys of Uprated Saturn I's or Saturn V's.

B

NOTES 9/11/ WILLIAMS B 9/18

9/13 9/13

I. Voyager Alternates: As was mentioned in the September 8 Board Meeting, for about one week we have been looking at various options which will allow some type of Mars Mission in '73. This is an inhouse effort utilizing available contractor data where appropriate. The effort was requested by Dave Newby - in response to OSSA - and is being accomplished in parallel to JPL and Langley efforts on possible up-graded Mariner and Lunar orbiter configurations for Mars/Venus orbit missions. In general, we are looking at:

A. Program Alternatives

1. Defer Voyager mission from '73 to '75 with no missions in '71 or '73.
2. One which will accomplish a meaningful mission in '73 but not contribute from a "Systems" standpoint to a '75 Voyager (JPL and Langley)
3. One which will accomplish a meaningful mission in '73 and allow some spacecraft development toward a '75 Voyager.
4. One which develops a "Voyager" spacecraft for a '75 mission and is used in a meaningful orbit only mission in '73.

B. Launch Vehicle Alternatives

1. Atlas Centaur } (JPL/Langley/Mariner/Lunar Orbiter)
2. Titan III C }
3. Titan III M or Saturn IB
4. Titan III M or Saturn IB transtage
5. Titan III M or Saturn IB plus Centaur
6. Saturn IB plus service module
7. Saturn V
8. Etc. (other combinations of Saturn IB and Titan III with various upper stages/systems such as the LEM-D) ✓

C. Spacecraft Alternatives

1. Mariner with uprating) JPL/
2. Combinations of Mariner and Lunar Orbiter) Langley
3. Something approaching the presently conceived Voyager spacecraft)
4. The Voyager spacecraft as is
5. A larger spacecraft (capable of delivering 2 capsules in '75) ✓

II. Lunar Flying Unit: We were asked by MSC to help set up and attend a meeting at Grumman on 9/14 with Bell, Grumman, MSC, and MSFC to discuss interfaces between the Bell Flyer and Grumman LM. Regardless which Center is assigned responsibility for the flyer, this meeting should benefit both contractors and NASA. Mr. Hal Trexler, who has handled the latest Lunar flying vehicle test program at LRC for MSFC, will attend the 9/14 meeting. ✓

III. JOVE: The system design study, Jupiter Orbiting Vehicle for Exploration (JOVE), funded by the Headquarters University Affairs Office as a part of their university "involvement" activity has been completed. Final reports are being prepared for publication. The study was conducted by 19 faculty members representing 14 colleges and universities throughout the U.S., and was co-directed by Will Jordan, ASO, as the MSFC responsible official and Dr. Reginald Vachon, Auburn University. A brief but more detailed report is attached. ✓

Attachment

SEPTEMBER 18, 1967

9/18/67 w/ comments Braun

NOTES
MR. GORMAN'S COPY
SEP 18 1967

w/comments

Hoelzer notes to
Mr Gorman.
Dr von Braun asked
a question.

B 9/21

NOTES 9/18/67 BALCH

9/18 NS

S-II-3 Testing - Repairs to sidewall insulation which failed during LOX/LH_2 tanking test on 9/6/67 have been completed, and results of subsequent leak checks and proof tests were satisfactory. First static firing is still scheduled for 9/19/67. Readiness review held on 9/15/67 was very well organized and informative, and significant improvement was noted in amount of open items remaining to be accomplished. First Article Configuration Inspection (FACI) team visited MTF to define the activities required at MTF for baselining the S-II-3 stage.

S-IC-5 Stage - Stage was removed from stand on 9/11/67 and shipped to Michoud the following day as planned. No difficulties were encountered with derricks during removal operation.

S-IC-6 Stage - Date for delivery of stage to MTF is still indefinite pending completion of revised test program schedule. S-IC-6 Data Requirements Programs has been published.

MTF Maintenance Management Plan - Presentation was made last week to S-IC and S-II Stage Managers (Mr. Urlaub and Colonel Yarchin), and they agreed to take the necessary action to get change orders issued to implement the MTF Maintenance Management Plan in the S-IC and S-II stage contracts.

Hurricane "Beulah" - Preliminary preparations for hurricane conditions at MTF were made the latter part of last week. Based on increased probability that hurricane "Beulah" might move toward the vicinity of MTF, Condition IV (72-hour alert) was declared at MTF about noon Saturday, 9/16/67, and is still in effect.

NOTES 9/18/67 BELEW

B 9/21

9/18 JFS

MSC DEVELOPED EXPERIMENTS: A funding freeze has been placed by the MSC AAP Program Office on MSC developed experiments. The freeze will remain in effect until the amount of funding to be made available for experiments is determined. This can impact integration activity on detail Interface Control Documents (ICD), 1-g trainer and neutral buoyancy units.

DELTA PRELIMINARY DESIGN REVIEW (PDR) PLANNING: McDonnell Douglas Corporation (MDC) has informed the Orbital Workshop Project Office that the engineering mockup will be updated and ready to be returned to the MSFC in December 1967. New dates for the delta PDR efforts are being negotiated but will probably occur in the December-February time frame.

MISSION A ORBITAL ORIENTATION: We are starting the preparation of the trade-off study report relative to Mission A thermal balance/power/stabilization. Some further refinement in the analysis and a few open items are being worked by R&DO. We expect to have the report completed with recommendations within about two weeks for presentation to Mr. Mathews for decision to update the cluster baseline configuration and orbital attitude.

APOLLO TELESCOPE MOUNT (ATM) SOLAR ARRAY MODULES: Manufacturing Engineering Laboratory is fabricating a light weight module using aluminum honeycomb core material (3.1#/cu ft). The new module will be approximately one pound lighter than previously fabricated modules. If these modules prove to be acceptable, approximately 400# will be reduced from the solar array weight (3790#) previously quoted with the existing modules.

NAVAL RESEARCH LABORATORY (NRL) ALTERNATE EXPERIMENT PROPOSAL: A meeting has been scheduled for September 22 to discuss schedules proposed in the NRL alternate proposal for the first and second ATM flights. Headquarters has requested that the NRL alternate effort not be initiated until this meeting is conducted.

HARVARD COLLEGE OBSERVATORY (HCO) "C" EXPERIMENT: The supplemental agreement to cover the definition phase of the HCO "C" experiment has been signed by both parties and initiated with an effective date of September 1. Partial funding for this effort is being processed.

AAP BUDGET PLANNING: We received guidelines last week for preparation of a POP for AAP due September 22 with initiation of the cluster in mid 1969 and ATM early 1970. This schedule contained over a year gap in IB deliveries and nearly a year gap in V deliveries. Today, it appears that we will be instructed to further increase the delivery gap and slip follow-on launches to the first cluster. In addition, we understand that this is still an OMSF approach and does not reflect a final decision by Webb/Seamans in AAP scheduling.

NOTES 9-18-67 BROWN

9/18 TS

B 9/21

H-1 ENGINE H-1 Engine H-156-4D, which demonstrated a rough combustion cutoff (RCC) after bombing at Neosho on 8/31/67, is being tested on the MSFC test stand (PPTS). It has damped normally from the three bomb tests conducted at PPTS to date. Three additional bomb tests are programmed. Stable operation of H-156-4D at PPTS substantiates the contention that the H-1 engine is stable, and that the RCC's are the result of a test stand anomaly at Neosho. ✓

J-2 ENGINE Reference my Notes of 9/11: (~~copy attached~~)

There were four successful tests at AEDC on 9/12/67. Three of the tests were S-IVB restart simulations and the other was a Saturn V/S-IVB first burn simulation. During these tests we also ran several configurations of the LOX pump cavity seal leakage vent line. During testing all lines that protruded into the exhaust stream registered positive back pressure that would cause a flow of exhaust gases up stream in the vent line, thus invalidating all designs that depend upon tip burn-off by the exhaust gases. (As you will recall the possibility of back flow of exhaust gases was the only remaining concern expressed during the PFR relative to the design currently on 501.) As a result of these findings, it appears that the backup approach, which incorporates a 28 psi burst diaphragm at the end of the current engine vent lines, will be adopted. Using this scheme, the leakage during both the boost phase and engine operation will be vented overboard through the stage line. If, however, the leakage is severe enough to cause a pressure in excess of 28 psi in the vent system, the diaphragm will rupture, thus permitting flow through the present engine vent line.

During the past month, results of tests on 17 LOX pumps at Rocketdyne and associated analyses reveal flow rates and temperatures which may cause a redesign of the stage lines in AS-501 (from the current Teflon approach to either stainless steel or aluminum). The new data is currently being evaluated by MSFC and contractor personnel, and a stage backup design is to be authorized by Saturn V immediately. ✓

NOTES 9/18/67 CONSTAN

9/18/67

B
9/21

BRAILLE BROCHURE

Request for the Michoud Assembly Facility's brochure, "A Trip to the Moon in Project Apollo," have continued to increase since it was first published last year. To date, 2,500 copies have been distributed on request to individuals and blind institutions in 46 states and 19 foreign countries. The brochure is now in its third printing.

STATUS REPORT - S-IC

S-IC-3 - Located in Test Cell #1 for incorporation of modifications. All modifications (approximately 978 manhours of Boeing work and 700 hours of Rocketdyne work) are to be incorporated and retest completed in time to support the new KSC on-dock date to be defined September 19, 1967.

S-IC-4 - Stored in Horizontal Assembly Position #2 (Bldg. 103, Factory).

S-IC-5 - Stored in Stage Storage Postion #2, Bldg. 420 (Test Cell #4) undergoing refurbishment.

S-IC-6 - Stored in Stage Storage Position #1 (Bldg. 103, Factory) until further notice.

S-IC-7 - In Post Manufacturing Checkout. It is anticipated that the "internal working date" of October 26, 1967, for PMC completion will be attained.

S-IC-8 - In the VAS tower.

S-IC-9 - The thrust structure, intertank, and forward skirt are complete, painted and stored in the factory. The fuel tank is in the Hydrostatic test position. It has been hydrostatically tested, irridited and final cleaned. The schedule for removing the tank from this position to the paint dolly is Monday, September 18, 1967. The LOX tank is stored in the tank repair position awaiting availability of the Hydrostatic test position.

B 9/21

NOTES 9/18/67 FELLOWS

9/18/67 D

1. Work Packages: General Bogart held a meeting September 15 with representatives of the Centers to clarify ground rules, confirm milestones in the schedule for submission of the work packages, and emphasize that Dr. Mueller considers the work packages very important. They are to be discussed at the November Management Council Meeting. According to the guidelines, these work packages are to be prepared in such discrete detail that Dr. Mueller can judge the merits and make decisions to proceed or not to proceed with the work as described by those packages. ✓

2. MSFC/KSC Mutual Assistance Program: As of September 18, the names of 71 technically qualified R&DO individuals, in support of 31 tasks, have been referred to KSC. Twenty-nine people, associated with twenty-one tasks, have been selected and twenty-seven have reported to K$C to date. ✓

NOTES 9/18/67 GEISSLER 9/18/67S B 9/21

1. S-II External Insulation (AS-508 & Subs): Re: your comment on this subject on Notes 8/28/67 Geissler, copy attached. A plan for aerothermal testing of the S-II-8 spray foam external insulation has been proposed by NAA/SD which utilizes the X-15 as a test vehicle. We reviewed this plan and found it to be acceptable. A request to Edwards AFB for support on this test is being prepared for your signature by S-II stage office. This test is to determine the adequacy of the external protective layer put on the insulation for handling protection and the properties of the spray foam insulation. The external protective layer on the insulation may degrade and flake from the stage during flight presenting a particle impingement problem similar to that presently experienced on the S-II-1 through S-II-7 insulation. The results of impingement studies of particles falling from the stage of the S-II-1 through S-II-7 have shown that the low density of the material precludes any critical flight hazard. The results of this impingement study are applicable to the S-II-8 and subs.

2. Engine-Out Briefing to Dr. Low: MSC personnel gave a status on LV/SC engine-out problems to Dr. Low on 9/7/67. As of the date of the Engine-Out and EDS Analyses Meeting held at MSFC on 8/10/67, the S/C had structural problems for one-engine-out for a large portion of S-IC stage flight. It was reported to Dr. Low that on the basis of revised input data that the S/C now has slightly positive margins of safety for the engine-out cases examined. It was proposed that MSC conduct a structural test program on S/C similar to that done by MSFC on L/V critical stations, and it appears that this will be done. MSFC/MSC efforts are still being pursued to investigate L/V and S/C engine-out problems. A large portion of this should be completed in September 1967; however, MSC will do thorough S/C loads and stress analyses which probably will not be finished prior to January 1968. Dr. Low also requested a detailed briefing on the CM, SM and LM structures. In conclusion, the engine-out problem presently is much smaller than it was a few days ago and additional work is being performed to verify this. The briefing was quite objective and the MSFC/MSC joint efforts on this problem were well presented.

3. Voyager-Alternate Systems Concepts: During the past week, R-AERO has participated in analysis of alternate launch vehicle and spacecraft concepts, attempting to find a low cost program to allow continuing a 1973 Mars mission. The initial goal was to develop a mission for 1973 with a Voyager type spacecraft (orbiter) that is directly applicable for an all Systems Voyager 1967 Mission. This arrangement dictates that the spacecraft weight be in the neighborhood of 5000 lbs excluding the inert weight of propulsion tankage. The following systems were analyzed: (a) Saturn V - with 2 Voyager spacecrafts; (b) Saturn IB - with 1 Voyager spacecraft, using the spacecraft for escape from earth orbit; (c) Saturn IB - Centaur - with 1 Voyager spacecraft; (d) Saturn IB - Apollo service module for earth escape - service module as spacecraft; (e) Saturn V - with 2 Apollo service modules; (f) Titan III M - transtage - Voyager spacecraft; and (g) Titan III M - Centaur - Voyager spacecraft. Results of the analyses indicate that only cases a, c, e, g, (Saturn V or Saturn IB and Titan III M with cryogenic third stages) are capable of providing sufficient performance to satisfy the initial objectives (i.e. delivering a 5000 lb spacecraft into Mars orbit.

As a result, only an Atlas-Centaur-boosted modified Mariner or modified Lunar Orbiter seem to remain as contenders for the '73 opportunity. E.G.

a and e are out, since Sat V would put '73 Voyager again into high cost class. c is out, because of dev. cost of SatIB/Centaur. g is a non-existent launch vehicle! A) B

NOTES 9-18-67 GRAU

9/18 KP

B 9/21

1. AS-501 SAFETY ASSESSMENT FOLLOW-ON: Personnel of this Laboratory continued support to the AS-501 Safety Assessment Follow-on at KSC. The follow-on is progressing normally and it appears that the count-down document will be the only major document not available for a complete review. It is anticipated that KSC will pick this item up, with the remaining last minute changes to the procedures, prior to launch.

2. IN-FLIGHT CONTROL COMPUTERS: We are also continuing to provide coverage on the cracked solder connection repair program of the Flight Control Computers at ECI, St. Petersburg, Florida. Repair is progressing satisfactorily on the computers for flights AS-204 and 502. The effort is requiring considerable overtime coverage.

3. S-IC QUALIFICATION CERTIFICATION: The Qualification Certification Program for S-IC-501 is complete.

4. H-1 ENGINE QUALITY MAINTENANCE PROGRAM: Receiving inspection, checkout, and disassembly of the first Quality Maintenance Program H-1 engine has been completed. Other than contamination in the lox cavity, which was found during receiving inspection, the engine was in excellent condition. It went through systems checkout and individual component checkout without any discrepancies being found. After disassembly, a few problems were found on the pump shaft. As a result of this program and the soft goods evaluation of the four-year old H-1-2038, we propose to reassess the amount of checkout and inspection of H-1 engines in the field.

NOTES 9/18/67 HAEUSSERMANN

9/18/67D

B 8/21

1. Cracked Solder Joints. Last week, the platform systems for 206 and 503 were inspected for cracked solder joints since these systems had over 600 hours of operational time but had not been exposed to environmental extremes. Cracks were found and therefore it was decided that the 501 platform system should be inspected. The 501 platform electronics did have cracks and the joints have been reflowed and potted. The system is being tested and scheduled to be back in 501 this afternoon (9/18/67). Inspection of platform systems for 502 and 204 will be accomplished and will be reworked as required.

2. Saturn Control Computer. During solder joint rework of the 501 spare, it was determined that a blocking diode had failed in a shorted condition. Certain test conditions caused this and the test equipment has been modified to prevent any recurrence. The 501 flight unit diodes have been tested for this condition and have been found to be satisfactory.

3. ATM Simplified Experiments. Based on direction from IO/AAP, we are turning on all R&DO elements to proceed with an ATM "A" (simplified Harvard and NRL experiments) for an earliest launch date of January 1970 and ATM "B" (sophisticated Harvard and NRL) for an earliest launch date of July 1971.

NOTES 9/18/67 HEIMBURG

9/18/67 AS

B 9/21

S-II-3 (MTF)

S-II-3 is scheduled for a planned duration of 65 seconds on September 19, 1967, at approximately 3 p.m. ✓

H-1 ENGINE (MSFC)

Four tests were conducted at the Power Plant Test Stand using engine H-156-4D to continue H-1 engine instability investigation. Three were bomb tests and dampened within specification limits. Four more bomb tests will be conducted this week. ✓

S-IVB (MSFC)

Two lox and hydrogen loadings were accomplished on September 12, 1967, to continue the investigation of the depletion level sensor cycling. Data obtained from three loadings indicates that fast fill is the cause of the sensor cycling. ✓

SATURN IB COMMAND MODULE ACCESS ARM

Testing of the prototype access arm hardware redesigned because of 204 fire is complete and the arm will be removed from the tower today. The system is operating satisfactorily with the exception of the adapter centering device, which is being redesigned. The new adapter centering device will be tested on the flight hardware, due in from KSC 9/19/67. Hardware to support first manned launch will be tested and shipped back to KSC by 10/9/67. ✓

SATURN V COMMAND MODULE ACCESS ARM

The Environmental Chamber (EC) was removed from the command module access arm on 9/14/67, and is being shipped to Cape Kennedy by Guppy today for rework to the new configuration (similar to the Saturn IB Chamber). The EC will be returned to MSFC for testing after completion of the rework. We have no schedule or planned application from KSC as yet. ✓

SERVICE ARM R&D LANYARD TEST

R&D test on the lanyard systems for service arms 4, 5, and 6 (S-II Intermediate, S-II Forward, and S-IVB Aft) are complete. Mod kits for the arms on ML-2 have been shipped to KSC for installation. Testing will continue to qualify the hardware. ✓

NOTES 9/18/67 JOHNSON
9/19/67

B 9/21

Adjustments in the Supporting Development Program - Following up discussions with Mr. Waugh, et al, of OMSF (NOTES of 9/11/67, copy attached) we have initiated efforts to redefine the Supporting Development Programs against the new technical and financial guidelines now available. Meetings are planned for today among P&VE, Saturn V, the Engine Office, and E. O. to prepare for a meeting with Mr. Williams (OMSF - Trimble's Office) on Thursday discussing adjustments in the Rocketdyne sustaining engineering effort and their impact on the planned J-2X/J-2S work.

B.J. I'd like to be kept informed about OMSF's ideas re cuts in this area before we, as a Center, commit ourselves to an emasculated J-2S effort. I consider the present J-2 engine as utterly complex and marginal, and have often said so. B

In general: the Supporting Development Program as originally defined is being reduced in total level (excluding J-2X/J-2S and stage impact study work) from $10M to about $6. 5M - $7. 5M with primary emphasis on Saturn and Saturn stage oriented tasks. Assuming that the reduction in the Engine Office's sustaining engineering effort of $12M stands, additional requests in the Supporting Development Program of $17. 6M to carry the J-2X/J-2S work against a 1970 implementation date will be required.

This will cover the $4. 5M J-2X effort originally planned in Supporting Development; $12. 5M in J-2S planned under the sustaining engineering effort and $600K, for preliminary engineering of the required S-IVB; SII changes to retrofit the simplified J-2 engines, originally planned under the Saturn V stage accounts.

ATTACHMENT: NOTES 9/11/67 JOHNSON (Dr. von Braun's and Mr. Weidner's copies only)

NOTES 9-18-67 KUERS
9/18 KS

B 2/21

Cryogenic Wire Stripper:

Removal of the insulation from the end of a stranded or solid wire has always been a problem. The use of mechanical wire strippers easily results in small damages such as nicking or scratching the wire while cutting the insulation off. The physical damage to the wire is avoided with hot wire strippers where heat is used to cut the insulation which is then pulled off. With Teflon-insulated wire, however, a thin film of melted Teflon is often deposited or smeared on the wire when a hot wire stripper is used. An additional mechanical cleaning operation is then needed in order to prepare the wire for a good soldering joint.

The new wire stripper makes use of the high brittleness of Teflon while at cryogenic temperature. The end of the wire from which the insulation is to be removed is immersed in liquid nitrogen contained in a small dewar; the cold wire end is then inserted into a machine where it is hit at a preset distance from the wire end by a cutter driven by a solenoid. This cutter does not cut deeper than 50% into the insulation but breaks the temporarily brittle Teflon sleeve down to the wire.

After warming up to room temperature, a short length of the insulating sleeve can be easily pulled off the wire by hand. The operation of cutting the insulation by this method might be done well in advance of the soldering operation. The insulating sleeve could be left on the wire to be removed only shortly prior to soldering or crimping thus protecting the wire against any contamination.

A patent has been applied for and the Technology Utilization Office has issued a Tech Brief to industry. They have received 80 inquiries to date. We have built a prototype machine for cryogenic wire stripping and we are in the process of building six further machines -- one for further developmental purpose, one or two for our own shops, and the balance for evaluation by our contractors, other Centers and industry.

NOTES 9-18-67 LUCAS

9/18/67

B 9/24

B.L. Pretty basic goof! B

1. SPRAY FOAM INSULATION TEST TANK FAILURE: Reference, Notes 8-28-67-Lucas, the 8-foot S-II spray foam insulation test tank failure was a simple case of exceeding the design strength of the tank. Apparently it was assumed that the tank forward bulkhead would be at a temperature of -423°F during the test since LH_2 was filled to approximately 11 inches below the bulkhead apex; however, the tank was pressurized with helium at ambient temperature. Thus, the calculated bulkhead temperature at the time of failure was approximately -200°F.

2. S-IC WHITTAKER LOX VENT & RELIEF VALVE: (Reference Notes 9-11-67 Lucas) The Boeing Company decided to use the installed valves for 501. We believe it would be in the best interest of the program to have the Whittaker valves replaced by Parker valves prior to flight. A compromise agreement has been reached to have Parker valves as back-up available to support countdown demonstration test and launch in case of failure. We are continuing our review of the impact of a leaking vent valve on S-IC loading procedure.

3. S-II PULSE ARC MIG WELDING STUDY: An evaluation was made last week of the NAA/SD results to date on the study of the pulse arc MIG welding process, and it was the unanimous conclusion by NAA/SD and MSFC that NAA/SD is not ready to change to the pulse arc MIG welding process. Apparently NAA/SD has not yet progressed far enough on the learning curve to properly implement the new technique. Furthermore, NAA/SD had not accomplished any fracture toughness testing on these weldments. We will not be able to accept this process until NAA/SD demonstrates the process will consistently produce mechanical properties and toughness at least equivalent to the old process in addition to meeting other specifications. It is interesting to note that using the TIG process, NAA/SD has made five consecutive cylindrical welds which required only four repairs in total. The implementation of the new cylindrical weld tooling has already resulted in a significant improvement in the TIG weld quality.

4. SPRAY FOAM INSULATION: Reference Notes 9-5-67 Kuers, our commitment to the spray foam insulation concept is not irrevocable on S-II-8 and S-II-9. Because of the difficulties encountered with the spray foam process and test tank, we are considering deletion of the spray foam from S-II-8 and S-II-9 and implementation of the previously developed contingency plan to use the 1.6 inch insulation. This will give us additional time to develop solutions to the recently developed problems.

5. VENTING THE J-2 ENGINE START TANK: We have reassessed the emergency procedure for venting the J-2 engine start tank at KSC in the event we have a malfunction on the vent system. The procedure would be to dump the start bottle through the engine into the interstage. There are some implications in that if we dry spin the pump we would have to remove (in the stack) and inspect it. Recycling those pumps back to Rocketdyne and installing would require about 16 days. We are also evaluating the possibility of using spares instead. We believe that the probability of a vent freezing at KSC is low because of adequate drying and purging of the interstage environment.

6. FREON 113 IN TITANIUM TANKS: (Reference Notes 9-5-67 Lucas). We have learned that this specific freon will not cause a problem with titanium and we are in agreement with MSC.

7. ATM SPACE CHAMBER CONTAMINATION TEST: Several weeks ago we were asked to recommend a space chamber in which a full scale ATM contamination test could be made. After reviewing available chambers, we recommended the Boeing-Seattle chamber. However, MSFC was essentially directed to use the MSC space chamber. Our people have visited MSC and determined that the contamination from the chamber would be greater to ATM than the ATM contamination. Now we have been asked and are in the process of cleaning the chamber for MSC so the ATM test can be done there. MSC will turn the chamber over to us on 9-21-67, and shortly thereafter we will have to send one or two men to MSC for several weeks.

→ So we are now MSC's janitor!?

9/18/67 H. H. MAUS

9/18 NS

B 9/21

OVERSITE SUBCOMMITTEE STAFF STUDY OF APOLLO & AAP - Chairman Teague of the NASA Oversite Subcommittee has announced plans for a staff study of the Apollo and AAP programs to be conducted during October and November of this year. It will be similar to last year's staff study of Apollo Pacing Items. Jim Wilson, Joe Felton and Peter Gerardi of the committee staff will tour the MSF centers and prime contractor plants, accompanied by Maynard White, Captain Freitag and Jack Cramer of NASA. The MSFC portion of the schedule includes NASA, CCSD, Boeing, and GE briefings in the New Orleans area on October 10 and 11, and Huntsville briefings on October 12. Visits will be made to McDonnell Douglas on October 31 and NAA Downey on November 1. Additional details will be made available in the near future. ✓

PLANNING GUIDELINES - We have received informal (telephone) information from MSF on the planning guidelines for POP 67-2 for Apollo (final) and AAP (preliminary). These guidelines are reported to be in writing from Mr. Webb. The basis is to be a plan which ends production of Saturn IB after vehicle 216 and continues Saturn V production at two per year for 516 and subsequent. Initiation of the two per year production on Saturn V is not to begin until FY-69.

H.M. likes with my dope B

The funding baselines are $250 M for AAP in FY-68 and $575 M for AAP in FY-69.

The philosophy is to concentrate on payload definition and development. ATM and the Workshop are considered approved projects.

Voyager will not be funded in FY-68 but will be funded in FY-69. A NERVA project will be included in FY-68 under a different name.

TASK WORK PACKAGES - Scott Fellows and Jay Foster attended the Work Package meeting on September 15, 1967 in Washington.

I seat TWX to GEM on 9/18 B

General Bogart opened the meeting by stating that this effort is "no fire drill but a five alarm fire" and that the system "will be implemented." No rebuttal opportunity was offered and General Bogart left the room having instructed the group to proceed with implementation.

The Centers were then requested to begin implementation in three phases: a. Identify work packages, b. Develop description of work and, c. Develop manpower, cost, and schedules for each work package. All three phases are to be complete by the November Management Council Meeting with the MSF team visiting the Centers twice before November to check on progress.

NOTES 9/18/67 RICHARD

9/18 9:45

B 9/21

Cold Flow Test at KSC: The Cold Flow Test scheduled last week (first on Monday and then on Wednesday) was intended originally to test the facilities. NAA (and R&DO) felt it would be an opportunity to also check the S-II/facility combination and get data prior to the CDDT. The test procedure included charging the J-2 control spheres, the engine start tanks, and He chilling the engine bells. We re-examined the thermal and engine conditions that would result in the test and confirmed that the test would be compatible with the hardware. However, should the emergency blowdown procedure be needed in the event of a vent failure on the start tank, the exact schedule impact could not be ascertained. As of test time, it appeared the potential impact might be severe. As a result, we and KSC agreed the test procedure should be altered to eliminate loading the start tank (similar to the S-IVB condition) and not risk a possible schedule delay, even though the probability of this failure was extremely small. This caused a reshuffle of the testing activities at the Cape. The final portion of this testing is planned to be finished today. ✓

Bellcomm AAP Configuration Study: Stimulated by several weight and performance reports showing uncomfortable payload margins, Bellcomm has made a configuration study on AAP missions. Since the current deficit on AAP 4 is approaching 5000 pounds, radical steps must be taken in mission requirements change as our implementation of requirement (hardware) is not that over-designed. Bellcomm will recommend giving up free flight of the LM/ATM, and re-use of the LM/ATM. These requirement changes presumably reduce weight to the point where cluster operations with the LM/ATM are feasible. We are following this activity and will take steps to maintain cluster operations with the LM/ATM within payload capabilities. ✓

NOTES 9/18/67 RUDOLPH

9/RQD

B 9/21

AS-501 Launch Vehicle at KSC:

o Change Requests: We are now one week from the countdown demonstration test and yet we are still receiving a considerable number of change requests from the laboratories. It is obvious that these changes were being studies in the labs at the time of your Pre-Flight Review (Aug 29-30); but they were not mentioned in the review, even though we had specifically requested the Lab Directors to surface any and all potential problems on AS-501. Why the Lab Directors did not mention these items at the time of the review is unknown to us; but we must have better cooperation if we ever expect to resolve the problems without delaying the launches.

Hermann Kreidler

Please take up in your R&D Council meeting. B

o Most critical problems:

a. S-IVB flutter kit requires modification. Recent tests at P&VE shows loss of structural strength beyond acceptable safety factor limits due to aerodynamic heating.

b. J-2 Engine LOX pump seal overboard bleed has turned out to be a bigger problem than described at your Aug 29-30 501 Pre-Flight Readiness Review.

c. J-2 Engine start tank emergency vent procedure: (See L. Richard notes of today - Sept 18).

d. Ground pneumatic system relief valve in S-IC system failed in QUAL test and required re-evaluation - probably design change necessary.

e. Soft release instrumentation and torquing requirements are a potential schedule delay.

f. S-II Batteries (Electric Storage Battery - Supplier) have demonstrated some performance differences. KSC and Astrionics have determined the present batteries unacceptable. However, backup batteries from Eagle-Picher are not expected to be available for CDDT. KSC required flight batteries for CDDT.

All the above problems are to be reviewed Monday (Sept 18) in a special meeting established with Dr. Rees, Dr. Lucas, Mr. Kroeger, KSC and appropriate contractor representatives. Disposition of all problems must be established immediately in order that CDDT and launch may proceed, otherwise major schedule changes may be required.

S-II-3 Stage at MTF:

o First captive firing is scheduled for Tuesday, 19 Sept and second firing is scheduled for Thursday, 28 Sept 1967.

NOTES 9/18/67 SPEER

9/18/67S

B 9/21

1. RANGE SAFETY MEETING: Gen. Stevenson chaired a general review of Apollo range safety policy matters on 9/15 at KSC. Dr. Debus, W. Schneider and others attended. Agenda items included all presently unresolved problems and it was evident that near pad impact protection for the VAB and other structures is considered a serious problem. However, the new ODOP impact prediction system should be operational for the AS-501 launch. High inclination orbits and the S-IVB destruct package for the Orbital Workshop were also discussed. No outstanding problems were identified and it was agreed that a follow up meeting with the Eastern Test Range is not required. ✓

2. OWS FLIGHT CONTROL PARAMETER REVIEW: A meeting was held Sept. 12 and 13 with R&DO, I-S/AA, Flight Control personnel from MSC and contractor personnel from MDC and Martin. MDC recommended a list of flight control parameters to the extent that Orbital Workshop (OWS) and Airlock systems have been defined. A similiar review will be held shortly for ATM flight control parameters. One item of considerable interest to the group was the late deployment of the OWS bumper shield which is now being designed to be deployed by the astronaut. The group felt that deployment of the shield by RF command should be considered as an alternate. ✓

NOTES 9-18-67 Stuhlinger

9/18/67

B 9/21

No submission this week.

NOTES 9/18/67 TEIR

9/18/67

B 9/21

MINUTEMAN STUDY: We plan to have the CCSD final presentation on 9/26/67 and the rebriefing of Mr. Mathews at Headquarters around the middle of October.

APOLLO FLIGHT MISSION ASSIGNMENTS MEETING: We understand that in Houston this past week General Phillips agreed to plan a backup AS-206/LM-2 mission to be flown in the event problems develop on AS-204/LM-1. MSC is still pushing this as a primary mission to be flown regardless of the AS-204/LM-1 results. They feel that even though AS-204/LM-1 is a 100% success the LM will not be manrated, therefore, another LM alone mission is required.

Based on the results of the meetings to be held at Headquarters this week, we will need to reschedule our in-house mission planning activities. However we will make no change until we get an official mission planning change.

HYPERGOL SPILLAGE AND LEAKAGE PROBLEM: We met with P&VE personnel on 9/11/67 and decided: 1. We should continue with the present IU and S-IVB covers which will provide protection for small amounts of hypergol spillage and leakage. AS-501 covers were delivered to KSC on 9/16/67 and the AS-204 covers are scheduled to be delivered on 9/22/67; 2. P&VE should study further the overall problem and the effectiveness of a water flush on removing or diluting hypergol fluids or vapors, the effect of such a flush on the launch vehicle, and the factors that must be considered in formulating a contingency procedure to use the flush. P&VE expects to have a report on their study available by the end of this week.

KSC held an exploratory meeting on this subject on 9/15/67 but no firm conclusions were reached since KSC has only begun to look into the details of the situation. KSC is planning to conduct a test program the latter part of this week to determine the effect of water on hypergol vapors, fluids, and fires. P&VE personnel will observe the tests. We expect to get KSC's position on this matter early next week after the tests are completed.

Q-BALL COVER: In a meeting held this week, KSC presented a design for the Q-Ball cover removal system which appeared satisfactory to MSFC personnel. It also appears that KSC can have this system implemented in time for AS-501 which will allow several flight tests prior to the manned flight.

NOTES 9/18/67 WILLIAMS

9/19 9/21

1. Lunar Mobility:

Lunar Flying Vehicle (POGO): Since our (MSFC) contract with Bell has been completed, they are beginning to make queries as to what they should do - pending further funding on the system/activity. That was probably (my understanding) for the Ostrander visit. We have had no formal request but feel we are not in a position to advise them (formally) on any particular course of action - i.e., leave it up to the company to decide for itself. MSC has been contacted by Bell and in essence, that is what they will or have been told.

LFV & LSSM: It is our understanding (via Mr. Gartrell, MSC, AAP office) that Dr. Gilruth is planning to write you (Dr. von Braun) a letter stating:

a. MSC should develop a LFV if one is to be developed;

b. and that MSFC could/might handle the engine development necessary for the LFV in support of MSC.

c. If a roving vehicle (LSSM, etc. - but I'm sure he doesn't include something like a MOLAB/MOBEX) is required, MSFC should develop it.

The proposal from Gilruth, if it is made according to the above, seems like a good compromise. As you realize, MSC is in the driver's seat regarding what system (LFV, LSSM or Mini-LSSM, etc.) can and will be recommended since they will be doing the lunar planning work for AAP. This puts us at somewhat of a disadvantage, but we will try to keep close enough to the activity to "keep the book straight."

2. Voyager:

Effort is continuing in support of Dave Newby to develop various alternative planetary program/vehicle/space craft options for the forthcoming OSSA/NASA meetings. We have arranged for representatives from Martin, Denver (T III Shop) to be in Advanced Systems Office on Tuesday, September 19 to give us a complete rundown on the Titan vehicle system and their capability. (This includes various versions of the T III C, T III M, T III F and the new T III G which is being pushed as a follow-on, I will give you a separate report on the T III G in a few days. In short, it is a growth version of the T III M that will provide payload capabilities up to about 90,000 lbs. into low earth orbit.)

SEP 5 1967

B 8/31

NOTES 8/28/67 GEISSLER

8/29 KS

1. S-II Insulation: The study has been completed concerning the impact of pieces of S-II insulation on downstream components. The particles will accelerate to high local velocities and will not be deflected by local flow fields to prevent protuberance impact. However, it is found that penetration does not take place of even the most critical fairings such as the 0.05" fiberglass H_2 feedline shroud. The engine shrouds and fins are even less susceptible to damage. Another area of concern was the effect of debris injected into the base through the aft-end scoops. This is not considered to be hazardous since the momentum of the material is absorbed by impact on the scoops. The only precaution is that the physical size of a single piece of debris not create a total load on a shroud that exceeds the load carrying capacity of the shroud. The results of the analytical study are being published in a technical memorandum. Wind tunnel impact tests have been completed and confirm the fact that no penetration takes place. The experimental and analytical results will be published in a NASA technical note. What saved us was the low density of the impacting particles.

E.G. I hope this conclusion is valid also for the MJ Spray On Coating (effective SII-8) B

2. AAP Cluster: The Martin integration contract effort on mission analysis for the cluster mission (AAP-2 and AAP-4) will involve orbital analysis relating to timelines, data management, orbital contingency plans, subsystem usage timelines, tracking, and other orbital analyses which MSC would probably prefer that MSFC not do. We wish to have some voice, however, in the orbital mission planning and use the Martin analyses since these reflect the manner that MSFC would prefer to see the mission performed. Ideally, it would be nice if MSC would work with us to make the Martin analyses more meaningful and useful to both Centers. Interface efforts in this direction will be attempted through the Mission Requirements Panel.

3. Vehicle 501 Roll Out: During 501 roll out and subsequent stay time on the pad prior to launch, we shall assist P&VE by furnishing an engineer to insure that appropriate wind data are recorded. Data will be used during analysis of vehicle responses during roll out.

Not distributed (A)

September 25, 1967

H

NOTES:
MR. GORMAN'S COPY
SEP 2 5 1967

with comments

No comment marked

for DEP-A

Dr. von Braun:

You skipped over Col. Fellow's NOTES.
Please mark them.

BH
9/28

B

NOTES 9/25/67 FELLOWS

B 10/4

1. GAO Facilities and Equipment Review: GAO, in the entrance conference Friday, September 22, said they would review the facilities and equipment programs in P&VE, TEST, and QUAL Laboratories and include the four-year time period, FY-64 through FY-67. In the facilities area, both CofF and minor construction will be reviewed. "Equipment," as defined by GAO for this audit, includes capital and non-capital equipment for which a rough estimate of the total number of pieces is between 25,000 and 50,000 for the three laboratories during these four years.

2. Work Packages: Approximately 100 work packages, identified by their respective numbers in the NASA coding structure, are being prepared by R&DO within Headquarters guidelines. The key people in the R&DO laboratories and offices have been collectively briefed with all available information so that the best job can be done on the work packages within an almost impossible schedule. To avoid incompatibilities in manpower figures and reduce laboratory work load during this intensified work package effort, R-OM will complete the manpower portion of the NASA report form for all work packages.

3. Cost Reduction Review: Last week, a NASA Headquarters group, headed by Brooks Preacher, made a thorough review of the MSFC Cost Reduction (CR) Program. After a brief visit with R-DIR and the staff, the NASA team audited the CR Program in ASTR, P&VE, and COMP Laboratories. The NASA team indicated that things looked fine and that the program has good top management support. However, the team thought that more people should participate in the CR Program by submitting their ideas on how to reduce costs.

4. MSFC/KSC Mutual Assistance Program: Thus far, 32 R&DO individuals have been selected for participation in this program. Evaluation reports are being received from the 18 men who have completed their assignments. No copies of the KSC supervisors' reports have been received, to date.

B 9/25

NOTES 9/25/67 BALCH

S-II-3 Testing - Stage was successfully static fired for a planned 65-second duration at approximately 8:09 p.m., 9/19/67. Preliminary evaluation indicates no restraint to a full-duration firing now planned for Wednesday, 9/27/67. Formal data evaluation is scheduled for today. This was the first hot firing on Test Stand A-1. The only significant facility problem was the failure during countdown of a gasket in the filter bypass system on the LOX main fill line. Gasket was replaced and no further difficulty was encountered. Ambient blowdown of sidewall insulation system was performed on 9/22/67 as a part of a study of failure modes. ✓

S-IC Stage - Date of delivery of stage to MTF is still indefinite. Continued uncertainty with respect to S-IC test program schedule has created certain MTF manpower and other resources scheduling problems. MTF management is actively working this problem at present. ✓

Stage Handling Derricks - Derrick control system modifications on S-IC derricks are complete. ✓

Alleged Damages from Stage Firing - A total of seventeen complaints as a result of the S-IC-5 stage firing on 8/25/67 have ~~not~~ Now been received. Claim forms have been completed on four of these and will be referred to the NASA General Counsel Office for final determination. So far, no complaint has been received as a result of the S-II-3 short-duration firing on 9/19/67. ✓

Hurricane "Beulah" - Condition IV (72-hour alert), which was declared on Saturday, 9/16/67, was discontinued on Wednesday, 9/20/67. All parts of the MTF Hurricane Emergency Plan work very well, including the Stage Contractors' plans. ✓

Freedom of Information Act, Public Law 90-23 - Received the first request under provisions of this act. Information concerning the GE service contract at MTF was requested by Mr. A.R. Adams, Grand Lodge Representative, International Association of Machinists and Aerospace Workers. ✓

Public Affairs - MTF was visited by Mr. Garvin Johnston, newly elected State Superintendent of Education for Mississippi. Mr. Johnston's position encompasses elementary, high school, and college level education for the entire state. ✓

NOTES 9/25/67 BELEW

B 9/25

AAP-1/AAP-2 EXPERIMENT ASSIGNMENTS: Mr. Mathews has agreed on a reduced (from 30+ to 23) baseline list of experiments to be considered for integration into AAP-2. The integrated priority list, approved by Manned Space Flight Evaluation Board (MSFEB), was used to compare against the constraints and to establish a compatible cutoff point for the integration efforts. Mr. Mathews also established a smaller operational baseline list with a cutoff at 75% of experiment crew time allocation. No approved Marshall experiments were included in either of these baseline lists with the exception of the proposed T027, Contamination Measurements. He plans to continue development of remaining experiments within budgetary constraints to provide backup for AAP-2 and later flights. Formal notification of these actions is expected shortly.

DATA RETURN CAPSULE: ML recommended to the MSFEB deferral of the Data Return Capsule development. This was based on the lack of a firm justification to accomplish the mission requirements for the first cluster based on a reduced experiment list.

ATM H-ALPHA TELESCOPE PROCUREMENT: Revised proposals to reflect compatibility with changes in the ATM system have been received for the H-alpha telescope procurement and are currently being evaluated. Negotiations are now expected to be completed by October 15. The Determination and Finding (D&F) for this procurement is still in Headquarters.

LANGLEY RESEARCH CENTER (LRC) MEETING ON ATM: Astrionics has scheduled a detailed technical exchange type meeting with LRC on September 26 at this Center. The primary purpose of the meeting is to explore in detail the ATM studies that LRC has performed and to outline to them specific ATM areas where we feel their efforts will contribute the most.

ATM NEUTRAL BUOYANCY TEST ARTICLE: The ATM neutral buoyancy test article is being assembled in Bldg. 4755. Plans for neutral buoyancy testing in the next 4-6 weeks are to study the translation problem from the Lunar Module (LM) over the solar arrays to the sun end of the canister. No film retrieval studies are planned in this initial effort.

LOCAL SCIENTIFIC SURVEY MODULE (LSSM): Dr. Seamans has written a memo to Dr. Mueller suggesting that contracted effort on the LSSM by Boeing and Bendix be discontinued with the exception of work now in progress. The Headquarters' AAP office is preparing a reply to this memo. Boeing's and Bendix's final presentations will be held on Wednesday and Thursday of this week. MSC's AAP Program office does not rule out the possibility of a smaller scale version of the LSSM which could be flown on a single launch mission in 1971-2. R&DO has investigated such a vehicle which would weigh 800 pounds and be capable of operations for three days, with the possible addition of automation equipment for operation subsequent to the three day period.

MOD KIT DESIGN REVIEWS: The remaining design reviews with McDonnell Douglas Corporation should be completed by mid-October; excluding three major subsystems such as solar arrays, active attitude control system, and instrumentation and telemetry. An expedited effort will be made with McDonnell to have these three subsystems available in the Documentation Review and the mockup in time for the delta Preliminary Design Review as presently scheduled (December - February).

NOTES 9-25-67 BROWN

B 9/25

H-1 ENGINE The stability test series on H-1 Engine H-156 has been satisfactorily completed at MSFC. This is the same engine that went rough during recent stability tests at Neosho. The engine damped satisfactorily on all seven bomb tests at MSFC; therefore, it appears the previous stability problem encountered at Neosho is connected with the test stand. Further investigations are planned to isolate the specific cause of the problem. ✓

F-1 ENGINE Further investigation of the previously reported abnormal carbon used in several F-1 primary LOX seals revealed that engine F-6043 on S-IC-6 contains a seal made from the abnormal lot. This seal will be replaced (no schedule impact). The investigation to date reveals:

Total rings possible from abnormal carbon lot	19
Identified by inspection	15
Destroyed in fabrication (not available for inspection)	2
Suspect not yet inspected (spare pump at MSFC)	1
Removed and returned to vendor because of leakage during engine 2nd E&M (not relocated)	1

No additional field action is recommended beyond replacement of seals presently identified. Our test history gives us full confidence in reviewing the last test on an engine and predicting the safety on the next test even if the engine had non-specification carbon. Therefore, the risk of potential degradation in reliability due to breaking into 26 delivered engines to positively establish that they do not contain abnormal carbon is not warranted. ✓

Delivery of the engines for S-IC-9 to MAF has been completed. The fifth and last engine in the set was delivered on 9/15. ✓

During the CDDT pre-count for vehicle 501, one of the three thrust OK pressure switches on engine F-3012, was found out of calibration. A review of past test history also indicated that the valve calibration had shifted. The switch was replaced Friday night, 9/22, by a Rocketdyne specialist who can accomplish the replacement without removal of the thermal insulation panels. It is anticipated that this work will be accomplished without schedule impact. ✓

J-2 ENGINE Reference my notes of 9/18. The LOX pump cavity seal leakage problem has been resolved for AS-501 with the utilization of a burst diaphragm at the end of the present thrust chamber vent line. With the exception of the burst diaphragms all engine hardware is installed on AS-501. Burst diaphragm hardware will be available by 9/29; however, the current installation (burn off tip design) will support CDDT. ✓

A static firing test was performed on the S-II-503 stage engines on 9/19, for a mainstage duration of 68 seconds. Engine performance was apparently satisfactory based on visual observation and preliminary data. The test included an engine gimbal step program. ✓

LN_2 and LH_2 dumps through the engine were successfully accomplished at AEDC in support of propellant tank passivation studies for the S-IVB orbital workshop. Data from these dump tests are being evaluated. In addition, five pump spindown tests were conducted at AEDC on 9/19, four in support of reduced S-II stage fuel tank pressures and the fifth to check out the engine start tank emergency dump procedures. Data from these tests are encouraging enough to warrant continued effort. The engine is being removed for installation of the second 225K engine. The initial engine was installed in the cell 18 months and accomplished 80 tests. ✓

NOTES 9/25/67 CONSTAN

B 9/26

Nothing of special significance.

NOTES 9/25/67 FELLOWS

1. GAO Facilities and Equipment Review: GAO, in the entrance conference Friday, September 22, said they would review the facilities and equipment programs in P&VE, TEST, and QUAL Laboratories and include the four-year time period, FY-64 through FY-67. In the facilities area, both CofF and minor construction will be reviewed. "Equipment," as defined by GAO for this audit, includes capital and non-capital equipment for which a rough estimate of the total number of pieces is between 25,000 and 50,000 for the three laboratories during these four years.

2. Work Packages: Approximately 100 work packages, identified by their respective numbers in the NASA coding structure, are being prepared by R&DO within Headquarters guidelines. The key people in the R&DO laboratories and offices have been collectively briefed with all available information so that the best job can be done on the work packages within an almost impossible schedule. To avoid incompatibilities in manpower figures and reduce laboratory work load during this intensified work package effort, R-OM will complete the manpower portion of the NASA report form for all work packages.

3. Cost Reduction Review: Last week, a NASA Headquarters group, headed by Brooks Preacher, made a thorough review of the MSFC Cost Reduction (CR) Program. After a brief visit with R-DIR and the staff, the NASA team audited the CR Program in ASTR, P&VE, and COMP Laboratories. The NASA team indicated that things looked fine and that the program has good top management support. However, the team thought that more people should participate in the CR Program by submitting their ideas on how to reduce costs.

4. MSFC/KSC Mutual Assistance Program: Thus far, 32 R&DO individuals have been selected for participation in this program. Evaluation reports are being received from the 18 men who have completed their assignments. No copies of the KSC supervisors' reports have been received, to date.

NOTES 9/25/67 GEISSLER B 9/26

1. AAP Mission Requirements Panel: Re: your question on this subject in Notes 9/5/67, copy attached. The MM strap-ons are not presently being considered for an AAP-3 application, even though the scheduled launch for AAP-3 has slipped. The probable solution to the AAP-3 payload problem will be some combination of the following actions being considered: (1) Eliminate the LM/ATM free-flight mode of data gathering, thereby reducing the LM loaded weight on AAP-4 so more expendables can be off-loaded from AAP-3 to AAP-4; (2) Fly AAP-3 CSM as a third stage to orbit; (3) Lower the insertion altitude of AAP-2 OWS from 260 n. mi. to 240 n. mi. thus reducing payload requirement across the board for all four flights; the orbital lifetime 2 σ guarantee would be reduced from 1 year to about 200 days; therefore, any requirement for revisit and reuse after the ATM mission would be eliminated; (4) Changing the requirement for a 56 day Mission B to a mission of less duration, thereby reducing requirement for AAP-3 expendables; (5) Eliminating all possible sources of conservatism in the AAP-3 performance estimate so that payload commitment can be increased; (6) Reducing FRP from 1500 lbs to 1200 lbs, with a corresponding payload improvement. An MSC-MSFC meeting on this subject is planned for Sept. 28 - 29. ✓

2. Special Conference on Molecular Radiation: A "Specialist Conference on Molecular Radiation and its Application to Diagnostic Techniques" will be held in the Morris Auditorium on October 5 & 6. It is sponsored by this Laboratory, and was conceived and shaped by an informal Industry-University-MSFC team, that has worked on related MSFC research programs for the past six years. The conference will deal with problems of thermal radiation from rocket jet plumes, and remote sensing in terrestrial and planetary atmospheres. An audience of about 150 invited people is expected. We have sent courtesy invitations to the surrounding institutes of higher learning (including, by the way, Alabama A&M College). Chairmen of this conference are Dr. Robert Goulard (Professor, Purdue University, and MSFC consultant) and Mr. W. K. Dahm (R-AERO-A). A program brochure and a sample of the letter of invitation are being sent to you separately. The letter of invitation sketches origin and purpose of the conference. ✓

3. Research Achievement Review: MSFC Research Achievements Review Number 10, concerned with Aerospace Environment will be held in Morris Auditorium on September 28, 1967. Since the primary responsibility for this area rests with this laboratory, the entire review will be devoted to work carried out by our Aerospace Environment Division. Major topics will be ground wind turbulence, gust factors, statistics - exposure periods, aeronomy, photographic meteors, and martian atmosphere since MSFC vehicle programs currently have strong interests in these areas. ✓

NOTES 9/25/67 GRAU

B 9/26

1. SATURN V VEHICLE COMPONENT CERTIFICATION PROGRAM: The SA-501 vehicle component certification program is complete with the exception of requalification of the S-II batteries. The SA-502 program is now underway. Approximately 20% of the components will require new certification due to configuration charges or conditional acceptance on SA-501. ✓

2. S-II BATTERIES: Two Electric Storage Battery Company (ESB) and two Eagle Picher Company batteries are scheduled for delivery to Downey, California, for qualification testing on September 29, 1967. Personnel from R-ASTR and this laboratory will monitor the testing, and we presently have a man at ESB to assist the DCAS representative during fabrication and testing of the S-II-501 flight batteries. ✓

3. NONDESTRUCTIVE TESTING: Through a supporting research contract with Lockheed-Georgia, this laboratory has examined the use of liquid crystals for thermographic nondestructive testing. A cholesteric liquid crystal mixture, that changes color reversibly with minute temperature gradients, can be sprayed as a temporary or permanent paint coating, or reused if sprayed on thin black plastic sheets and applied to structure surfaces by vacuum or mechanical methods. Internal discontinuities, splice joints, entrapped moisture, etc., in bonded or honeycomb structures can then easily be detected, in brilliant color, on the surface of the structure. ✓ We recently demonstrated the system to several Laboratories, Army Missile Command, and the Technology Utilization Office. This technique has proven feasible in applications which would otherwise require more complex and costly infrared systems; and has generated considerable interest throughout the country. There are many potential uses for the liquid crystal mixture (for instance, MSC is interested in examining its use on space suits to detect astronaut temperature changes); and we plan additional applications development and equipment evaluation as it relates to our business. Attached is a photograph showing delamination (row 1) and lack of adhesive (row 2) in a test panel. ✓✓

ATTACHMENT: Photograph (Dr. von Braun's copy only)

NOTES 9/25/67 HAEUSSERMANN B 9/26

1. ATM Star Tracker. Mr. Forsythe of OMSF visited us last week to hear our position on the star tracker for the first ATM. Since the high accuracy in roll is not required by the experiments on the first ATM, Headquarters has questioned the need to fly the tracker on that mission. The tracker is intimately tied in with the control system and CMG momentum desaturation and although a simpler but somewhat degraded mode could be flown without the tracker our position is to fly the total system on both vehicles. Flight experience will also be gained on the tracker during the first mission.

An internal problem also exists in that Mr. Buckner's office states that the procurement action has been delayed so long and a rebid for the tracker is necessary.

2. ATM Power. Bellcomm representatives visited us two weeks ago and their pitch was that we could reduce the size of our solar array and quantity of batteries. This was based on the following:

a. Improve the charger/regulator efficiency

b. Eliminate or drastically reduce the time between revisits for the first clustered ATM.

With respect to the efficiency, they were using numbers used in the March quarterly review. Since then our designers have stated better performance can be achieved, but this gain has been offset by a 10% power growth which has occurred since that time.

With respect to the revisit, we have constantly raised the question to Headquarters that more definitive requirements must be established for the revisit mission. In the case of the power system, we agree that the 6% allowance for radiation degradation can be eliminated in the solar array design and the number of batteries can be reduced based on the smaller number of charge/discharge cycles.

In the absence of more specific requirements for the revisit mission, we are proceeding with our own assumptions and will assess the impact on the power system as well as the other ATM systems.

3. ATM Experiments. Naval Research Laboratory personnel visited MSFC to discuss the simplified experiments. The NRL "A" instrument will be identical for both ATM missions and will not be simplified. The NRL "B" instrument for the first ATM will have a spatial resolution of 2.5 arc sec. (instead of 1 arc sec.) thereby allowing a fixed grating to be used, a less complex mirror servo system, reduced spectral resolution and less stringent thermal control.

Harvard College personnel visited MSFC for a design review of their sophisticated experiments. Dr. Reeves (HCO) agreed to reduce the data load for the HCO-B instrument from 4 to 2 cameras. This will materially assist in the current problem of volume and weight capacity within the CSM. A firm workable quality and reliability assurance plan which involves the Ball Brothers Research Corporation apparently has also been solved.

NOTES 9/25/67 HEIMBURG

B 9/26

S-II-3 (MTF)
The acceptance firing is planned approximately September 27, 1967. ✓

H-1 ENGINE (MSFC)
Tests No. P1-512, 513, 514 and 515 were conducted at the Power Plant Test Stand on Engine H156-4D during the week of September 18, 1967. All tests were conducted with bomb installed in the injector face and during each test the bomb induced instability dampened within the specification limits. This concluded the bomb test series on Engine H156-4D. ✓

SATURN V HOLDDOWN ARM PROTECTIVE COVER
Test Laboratory tested a prototype Holddown Arm (HDA) Protective Cover for KSC. Results of the test indicate that design deficiencies exist and that the KSC established test criteria was not met. The "as-tested" configuration and the AS-501 configuration differ due to schedule limitations imposed on manufacturing and testing of the cover. Premature closure of the cover could result in damage to the vehicle. Test Laboratory recommended, in a recent transmittal, that KSC Engineering re-evaluate utilization of the protective cover for AS-501. ✓

NOTES 9-25-67 HOELZER

B 9/26

NEGATIVE REPORT.

NOTES 9/25/67 JOHNSON

B 9/26

MSFEB - The following items of interest resulted from the MSFEB meeting on 9/18/67:

a. The AAP Office recommended that no further work be done on the development of a data return capsule system for the AAP Cluster missions. The Board accepted this recommendation.

b. Contamination experiments, including the proposal by MSFC, were referred to the Ad Hoc Contamination Committee chaired by Mr. Maurice Dubin, OSSA. The Committee report was requested by 10/3/67.

c. The Thermal Control Coating experiment (MSFC Experiment #2) which was previously assigned to Apollo has been reassigned to AAP and will probably fly on the Vehicle with IU206.

d. The MSFEB accepted a listing of the present priorities of approved experiments which will be used by the AAP Office to establish flight assignments, integration plans, and flight plans. The list, as submitted, will be included as an enclosure to the minutes which should be available in 3-4 weeks.

NOTES 9-25-67 KUERS

B 9/26

S-II Pulsed Arc Welding: There are two types of circumferential welds in the S-II containers: The LH_2 dome to cyl #6 weld and all the other circumferential welds of the structure. The LH_2 dome to cyl #6 weld is different from the other girth welds by its specific configuration (heat sinks, stresses in the dome, etc.) and its specific gage thickness--it is the thinnest girth weld of the structure. Because of these factors it is the most difficult girth weld to make in the S-II structure. This is clearly reflected in the quality records for this LH_2 dome to cyl #6 weld. S-II-6 had for this weld 41 rejected X-ray films (approximately 30% of total circumference); 35 of the defect zones were bought off by MRB actions, and 6 had required repairs. Maximum offset of this weld had been 0.068". The same weld for S-II-7 had 23 rejected X-ray films, 15 of which were waived by the MRB, and 8 repairs were made. Offset for this weld is not known here. For S-II-8, 32 rejected X-ray films were reported last Friday (for the penetration pass only). In contrast, the other cylindrical welds recently performed at Seal Beach had only a total of 4 repairs in 5 consecutive welds. The decision to postpone the application of the pulsed arc welding technique to S-II-9, has been made by SD/NAA Engineering only because of allegedly insufficient statistical data for tensile and elongation properties at cryogenic temperatures. The results of tests of more than 400 pulsed arc weld samples at NAA did not indicate any marked difference between TIG and pulsed arc welds. All values were well above design specifications. Messrs. R. Ruud, Van Leuven and G. Lewis have stated that they were ready to use this new technique on the next LH_2 dome to cyl #6 weld. It is regrettable that we still continue to produce LH_2 dome welds, which are full of defects while we have a better technique on hand that will reduce the number of defects by 80 or 90%.

to postpone

URGENT

I.O.

I understand that Lucas is still reluctant to release pulsed arc welding before he has conclusive cryogenic toughness data. In view of the new relaxed schedules can't we postpone making these critical LH_2 dome/cyl. #6 welds for a few weeks, rather than building tanks full of defects? B

NOTES 9-25-67 LUCAS

B 9/26 B.L.

1. S-II STRUCTURE TEST PROGRAM:

a. Fabrication of the "A" Structure (LH_2/Lox Tank and Aft Skirt Assembly) is proceeding with the Lox tank weld being the only remaining major fabrication activity. 542 of 841 strain gages have been installed. Present success schedule shows on dock at MSFC 11-6-67. Based on this, testing will be completed by the end of May 1968. This is a slip from the end of March shown on Test Plan.

On time for AS-504 launch (latest schedule) 2. B

b. "B" Structure (Forward Skirt and LH_2 Tank Assembly). Based on present shipping dates, the "B" testing at Santa Susana (originally scheduled for the end of January) will be completed by the end of March 1968.

c. "C" Structure (Thrust Structure/Aft Skirt Assembly). Two recently identified problems are causing approximately a four week delay in the start of the testing. A requirement exists for cooling of the forward thrust cone area to a maximum of -50°F to properly simulate flight conditions for the aft skirt test. In addition, flight type tension straps are now required at the forward separation plane (Station 1760) as a result of the cooling requirement to properly simulate joint stiffness and resulting thermal deformations. Strain gage and heater strip installations are complete and systems checkout is presently being accomplished for the initial test phase. Testing is now planned to start (MSFC) on 10-15-67, and be completed by the end of January 1968. This delay in completion does not impact the launch of AS-504 since the "A" test project completion date is the pacing activity.

2. LM ASCENT ENGINE: Mr. Bob Richmond of our Propulsion Division terminated his residence at Bell Aerosystems Co. 9-1-67. However, the Combustion Stability Task Group, of which he was the MSFC member, will remain active until a satisfactory solution has been demonstrated. The task team during five weeks' residence at Bell made approximately 20 significant recommendations concerning overall approaches, design detail, testing, instrumentation and facilities. Almost all of these recommendations were adopted in some form by Bell. To date, Bell appears to have a satisfactory solution in the form of a 3-blade baffle with an inner ring. Two other approaches also look promising.

3. AAP PANEL ACTIVITIES:

a. The Mechanical Panel will have its third meeting (at MSC) on 9-27-67 and 9-28-67. Major topics will be ICD's, docking loads, ATM/SLA strength capabilities, impact of possible rotation of MDA, Nose Cone/SLA jettisoning scheme.

b. The first meeting of the Systems Safety Panel was held at MSFC on 9-14-67 and 9-15-67, and the official charter was signed and distributed on 9-18-67. A significant result of the meeting was that the panel agreed to review the total systems safety, and to facilitate this overview, a representative of each of the other AAP Panels will be included as a member of the Systems Safety Panel.

4. J-2 ENGINE START BOTTLE ON S-II-502: The start bottles and associated hardware were overpressurized inadvertently (operational goof). The maximum pressure put into the bottles was 1650 psia, and the tank was proofed to 1800 psia, so the tank may still be satisfactory. However, the start tank vent and relief valve and the drain line almost certainly will have to be replaced. The diaphragm in the vent portion of the valve is limited to 35 psia reverse pressure and was subjected to 1650 psia. The drain line is designed for 500 psia - was subjected to 1650 psia.

5. S-II-503 CRYOGENIC BLOW DOWN TEST: Operational problems with the helium purge system and the inability to remove the special S-II-503 test vent ports precluded completion of the cryogenic blow down test as originally planned. One insulation face sheet defect was noted by visual observation prior to the cryogenic blow down attempt; this defect was clearly observable on TV and was known to be quite small. Post test inspection revealed that the defect was approximately 0.17 inch in diameter; several other minute defects were noted in the preliminary post test inspection. Another insulation blow down test is planned.

NOTES/9/25/67/MAUS

B 9/27

BUREAU OF BUDGET REORGANIZATION - Bureau of Budget is undergoing a reorganization which will impact on the FY-69 budgetary process. In this reorganization, NASA and AEC are being transferred from BOB's Military Division to a new Economic, Science and Technology Division directed by John D. Young. Mr. Young, who headed the BOB task force that recommended the reorganization, was with NASA from 1960 to 1966. He left NASA to become Assistant to the Director, BOB, in May 1966.

The new Economic, Science and Technology Division will review the programs of NASA, AEC, Department of Commerce, Department of Transportation, National Science Foundation, and the Small Business Administration.

SUCCESSIONS OF AUTHORITY - We have an action item from Paul Cotton to reaffirm the succession of authority listing for MSFC, and to provide a list of all key officials reporting to Dr. von Braun to the depth of three successors for each. For this exercise we plan to interpret "key officials" to include only the directors, I.O. and R&DO. We shall work with Mr. Weidner and General O'Connor to develop these lists.

DESIGNATION OF ADP CATEGORY MANAGERS - Mr. Carl Prince, Assistant Director of Computation Laboratory, Mr. Gerry Turner, R-TO-G, and Col. C. Williams, I-CO-LH, have been named as managers for the computer categories A, B, and C respectively. As you know, these categories are defined as A. general purpose equipment, B. general purpose equipment intergrated into a larger system not basically computational, C. contractor owned or operated equipment (either A or B type). Delineation of functional interface between the category managers and the Computation Laboratory is now being prepared by Tom Smith's office serving as secretariat to the ADP Management Decision Group.

NOTES 9/25/67 RICHARD

B 9/27

AS-501 Liftoff Dynamics Presentation: Mr. Rees and Dr. Rudolph have requested a detailed review and briefing on the AS-501 liftoff dynamics. This basically involves questions of physical clearance between the vehicle and launch facilities during the first 11 seconds of flight. Details of the soft release mechanism will also be reviewed. This presentation is tentatively scheduled October 4, 1967, 9-12, Room 612, Building 4202.

Bonnie noted BH 10/2

This coincides with the MCM Exec. Session, I would very much like to attend this, and I am sure Dr. Debus would, too. Can we revamp the timing of the 2 meetings to remove confliction? B

NOTES 9/25/67 RUDOLPH

B 9/27

AS-501 Launch Vehicle at KSC:

- The installation of the air flow blocking "clips" on S-IVB stage forward skirt anti-flutter kit (to prevent excessive aerodynamic heating) was completed on Saturday, Sept. 23, 1967.
- Countdown demonstration test (CDDT) is scheduled to begin on Tuesday, Sept. 26 and will be completed on Friday, Sept. 29, 1967.
- Dr. Speer and I intend to fully and solely utilize LIEF and HOSC for the resolution of all CDDT problems as we want to simulate launch day activities as much as practicable.
- Mr. J. T. Murphy, my deputy for management, participated in Dr. Debus' Launch Readiness Review on Tuesday, Sept. 18, 1967.
- In the past few weeks we have organized and directed our contractors in comparing their latest design drawings vs. the "as installed" drawings at KSC. In comparing the (MSFC/design contractor furnished) checkout requirements, specifications and criteria vs. the KSC procedures, we now have a thorough identification of the few items "not yet installed"; and have resolved the few minor differences between our specification/criteria with the checkout procedures.

Latest;

- General Phillips' Flight Readiness Review is now scheduled for Monday and Tuesday, Oct. 2-3, 1967 at KSC.

9-10

Bh 10/2

Boeing Contract for Apollo Technical Evaluation and Integration (TIE):

- General Phillips has approved our plan for integrating their TIE contract with our Boeing System Engineering and Integration (SE&I) contract. The plan leaves our SE&I contract "as is" at MSFC.
- The plan creates a separate MSFC part of the Apollo TIE contract which provides for contractual interfaces between the two contracts.
- The plan establishes MSFC and Boeing (Huntsville) managers for the 12 TIE task areas (such as Program Control, Configuration Management, etc.); and indicates how there will be a free flow of data between these managers and their NASA/Boeing counterparts at MSF and other centers. (Boeing will be responsible for the integrity of the MSFC data).

NOTES 9/25/67 SPEER

B 9/27

1. AS-501 MISSION RULES: Re: your question about abort capability (Notes 9/11/67 Speer; cy attached): The lack of abort capability prior to the 25 sec exists only on AS-501. On subsequent unmanned flights the Launch Director will execute abort commands between liftoff and tower clearance if required. On manned flights, the crew will have abort capability starting with arming of the Launch Escape System (LES) at T-30 min.

2. AS-501 MANDATORY TELEMETRY LINKS: We presently carry 21 individual launch vehicle telemetry links and multiplexers for inflight measurements in the AS-501 Mission Rules as mandatory to T-11 sec, which is the latest time permitted for manual cutoff of the automatic sequence. As a result of action assigned at the Phillips Mission Rules Review on August 22 to minimize the items requiring cutoff after automatic sequence start (T-187 sec) we have now agreed with Mr. Neubert, Dr. Rudolph, L. Richard and all Laboratories concerned to change our telemetry link rulings after T-187 sec. The proposed change would require cutoff prior to T-11 sec for loss of any one of three individual mandatory links (AP1, BP1, DP1), one individually mandatory multiplexer (S-IVB-BO), any two of the six Single Sideband links, any other two (PCM or PAM) telemetry links on the launch vehicle, or any two other multiplexers on a given stage (vehicle redlines are listed independently and are not affected by these rules). This change is based on a priority ranking of links and multiplexers. Loss of any link or multiplexer will compromise certain mission objectives to a degree; however, we avoid cutting of auto sequence and possible launch rescheduling for anything less than catastrophic loss of flight data.

3. AS-501 LIEF SUPPORT ENGINEER'S BRIEFING: A briefing was held Wednesday, September 20 for all MSFC and IBM personnel identified as LIEF Support Engineers for the AS-501 Countdown Demonstration Test (CDDT). Ninety-four of these one-hundred forty-six support engineers attended the briefing. The briefing familiarized the engineers with their responsibilities and the procedures to be followed for LIEF Support during AS-501 launch activities. A second briefing will be held T-1 day before CDDT for the forty-two TBC, SD, & MDC support engineers who will come from out of town. The fifty-two local engineers who failed to attend the first briefing have been notified of the importance of their support and requested also to attend the re-run briefing at T-1 day.

4. MISSION FAILURE CONTINGENCY PLANNING: A meeting was held at OMSF on 9/18 to review the draft of the new Apollo Mission Failure Contingency Plan with all MSF Centers. We are now developing a detailed MSFC plan (as required by the Headquarters plan) and will present a summary at the next MSFC Board and Staff meeting (10/6). This plan would apply to AS-501 if needed.

Notes 9-25-67 Stuhlinger

B 9/27

1. FUTURE ASTRONOMY ACTIVITIES: Please refer to your comments on SSL Notes of 9/11, copy attached.

ASO, IO, and SSL are presently preparing a presentation for you on "Astronomy Activities at MSFC" on October 13. The points I mentioned in my Notes of 9/11 will be covered in this presentation. ✓

2. OPTICAL CONTAMINATION FLIGHT EXPERIMENT (ATM): The two flight experiments proposed and prepared by SSL (Photometric observation of light-scattering particles; and collection of material deposits on sample surfaces) were submitted last Monday to the MSFEB, with strong support and with high priority rating from OART and OMSF. Maurice Dubin from OSSA, whom Dr. Mueller had requested several weeks ago to act as chairman of a Contamination Committee, raised objections, stating that the ATM Contamination Experiments would duplicate OSSA experiments planned by Dr. Ney and Dr. Hemenway. Actually, Ney's experiment concerns the observation of Gegenschein and Zodiacal light and Hemenway's concerns collection of cosmic dust. These experiments will not provide the full answers needed for ATM, but Dubin feels his experiments can be modified to fulfill ATM objectives. The MSFC contamination experiments are in an advanced stage of definition; a fully functional engineering model of both experiments is contracted for and scheduled for delivery in November. Dr. Mueller stated that the MSFC experiments should be submitted again in October after Dubin's committee has formed an opinion. ✓

3. LECTURE TO ANTARCTIC RESEARCH TEAMS: Phil Smith asked me to give a lecture on "Sun-Earth Relations" to an assembly of 200 men preparing to go to Antarctica this season at a familiarization meeting at Shenandoah, Virginia on 9/19. This season's research program covers a large number of subjects in meteorology, ionosphere physics, aurora, cosmic rays, magnetism, geology, paleontology, biology, and psychology. ✓

4. NAS-FELLOW: Dr. Lal from India has been with SSL as a NAS Research Associate for 3 years. His work on crystal lattice structure and UV influences on ZnO pigments was very successful; he published 6 scientific papers while working with Gerhard Heller and William Snoddy. A short good-bye visit with you has been planned for October 9. ✓

NOTES 9/25/67 TEIR

B 9/27

REWORK OF AS-204 FLIGHT CONTROL COMPUTER (FCC) SOLDER CONNECTIONS: The assigned spare flight control computer from AS-204 is currently being reworked at Electronic Communications, Inc. (ECI). The rework and test of this unit was scheduled to be completed this week but problems developed in the rework of a D.C. amplifier module which is packaged with cordwood techniques. This module is unique to the Saturn IB flight control computers and could not be disassembled for the rework without destroying the module. ECI is currently assembling a new module incorporating tubelets and strain relief on the solder connections as they assemble the module. Completion of rework is scheduled for 10/2/67 and this unit will then have to undergo a dynamics simulation test which will require six days. Delivery to KSC for installation on IU-204 is projected for 10/9/67. This delivery date will cause KSC to reshuffle portions of their checkout but will not impact the end date of their working schedule. ✓

AS-205 ATTITUDE CONTROL SWITCHOVER CAPABILITY: Reference is made to my notes of 6/19/67, copy attached, concerning an official request from MSC that MSFC provide capability for spacecraft takeover of attitude control during orbital maneuvers on AS-205. After a thorough assessment of several approaches to implement this capability, we met with R&DO and IBM personnel last week and decided on the best approach. The present AS-209 flight control computers will be utilized for AS-205, with one AS-205 computer being reallocated for IBM internal usage in place of the presently scheduled spare 209 computer. This essentially results in no less CSM configured spare computers than planned with little or no associated cost increase. The AS-205 computer has been modified three times to date and this would have been a major modification due to physical space limitations of the AS-205 computers. I feel we will be much better off with this new computer for our first manned shot. The AS-209 computers already have the attitude control switchover capability. We will notify MSC this week that we will provide this capability on AS-205 per their request. ✓

AS-205 CREW BRIEFING AT IBM, HUNTSVILLE: We have met with IBM and discussed the crew briefing requirements. They have established a tentative agenda which indicates they have a good grasp of the level of detail to be presented as well as the briefing content. It is anticipated the briefing will begin at 9:00 AM and continue to 5:00 or 6:00 PM on 10/3/67 with a dry run the morning of 9/28/67, however, these dates may slip depending on the AS-501 CDDT. ✓

UNIT LOGIC DEVICE (ULD) PROCUREMENT: Reference is made to my notes of 9/11/67, copy attached, concerning IBM's planning to phase out their ULD production unless they get a go-ahead for additional LVDC/LVDA's by 9/15/67. A change order has been issued to IBM for ULD's to support the logistic requirements of the LVDC/LVDA's already contracted for. This will carry ULD production through 11/30/67. A supplemental agreement for LVDC/LVDA's for AS-513 through AS-515 has been negotiated and is currently in the review cycle at MSFC before being sent to NASA Headquarters for approval. This S/A will extend ULD production into 1968. ✓

B 9/27

NOTES 9/25/67 WILLIAMS

1. Administrator's Program Review:

Bill Tier, Keith Chandler and I attended the Administrator's Program Review on September 21 which included three areas: Mission Analysis Division (the OART study group at Ames), Chemical Propulsion, and OSSA launch vehicles. The three of us plan to give a short review at the next Board meeting; however, there were several comments made by Mr. Webb with regard to the Saturn IB Vehicle that may be of immediate interest. Mr. Webb mentioned several times the fact that he had made a public statement that "We will not procure vehicles past 216", and the gist of the statement and discussion left the definite impression that the door to procure additional IB's is not closed and locked. (At one point re this subject, Mr. Webb said that it would "depend on the FY-68 and FY-69 budget".) He did make it fairly clear that before additional vehicles would be ordered, payloads/missions would be approved and also funded and that a complete systems analysis (including management as well as cost-effectiveness) would be made relative to IB (and/or uprated versions) and the T III family. Or to say it in simple words, we are going to have to sell a mission and show the IB is "best" if we expect to sell 217, etc. ✓

2. T III Information:

We had a group of Martin - Denver people visit MSFC on September 19 to review various aspects of the complete T III family, including T III G. We are collecting and analyzing all the data we can get our hands on and are preparing ourselves for the upcoming NASA-DOD study/exercises. ✓

3. Visit to ASO:

I would like to thank you and Mr. Weidner for the half-day you spent with your Advanced Systems people. Your visit did much to stimulate the people as well as provide the senior people with guidance. ✓